SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1894, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXI.—No. 13. ESTABLISHED 1845. | NEW YORK, SEPTEMBER 29, 1894. | $3.00 A YEAR. WEEKLY.

THE U. S. BATTLE SHIP MAINE.

This vessel, now having her preliminary trials in Long Island Sound, is greatly more formidable for war purposes than the cruisers which have been heretofore added to our new navy, on account of her strong défensive armor and the heavy guns she will carry. She was designed by the Navy Department and built at the Brooklyn yard, under an act of Congress approved August 3, 1886. Her armor was made by the Bethlehem Steel Works, and the long time taken in the construction is partly attributed to delay in receiving the armor plates. The vessel was launched November 18, 1890, and illustrations of the event were then published in the SCIENTIFIC AMERICAN.

The Maine is built of steel throughout. Length over all, 324 feet 4½ inches; on load water line, 318 feet 3 inches; extreme beam, 57 feet; mean draught, 21 feet 6 inches; displacement, 6,682 tons. She has a protective belt of nickel-steel armor, 12 inches thick, for a distance of 180 feet of her length on each side, covering her machinery and vital parts. The bottom is double, with numerous watertight subdivisions, and she has a protective deck of steel, 2 inches thick amidships and 4 inches thick on the sloping parts. She is designed to have a speed of 17 knots, and her coal-carrying capacity is rated as sufficient for 7,000 knots steaming. The engines were built by Messrs. N. F. Palmer, Jr. & Co., New York City, and are of the vertical, inverted cylinder, triple-expansion type, the cylinders being 35½, 57, and 88 inches in diameter, and the stroke, common, 36 inches. There are two engines actuating twin three-bladed screws, of a diameter of 15 feet each. At 132 revolutions the engines are designed to give about 9,000 indicated horse power. There are eight steel boilers, 14 feet 8 inches by 10 feet, designed to work at a pressure of 135 pounds. The pumps are of the Blake type, and they will supply hydraulic power for a variety of uses.

The battery of the Maine is to consist of four 10 inch rifled guns mounted in two turrets, one forward on the starboard side and one aft on the port side. These guns will be protected by the 12 inch armor of the turrets and by 8 inch shields. They each throw a projectile weighing 500 pounds. An auxiliary battery consists of ten 6-inch rifles on the battery deck, protected by 2 inch shields, and there is a secondary battery including four 6-pounder, eight 3-pounder, and two 1-pounder rapid-firing guns, with four revolving cannon and four Gatling guns. There will also be seven torpedo tubes, with range round the entire horizon. She will have a crew of about 350 officers and men, and her cost is placed at $2,500,000.

A New Alloy.

This alloy has the appearance of silver, receives and retains a high polish, does not tarnish, can be rolled into sheets or drawn into wire, and is cheap to manufacture. It is composed of copper, nickel, spelter, antimony, tin, and lead, and is prepared as follows:

Mixture number one is first prepared by melting 78 pounds of copper and adding first 20 pounds of nickel and then 12 pounds of spelter, 1 pound of antimony, and 1 pound of tin. Sixty-four pounds of this mixture is then melted and 32 pounds of spelter, 2 pounds of tin, and 8 pounds of lead are added, thus forming the improved alloy.

Antiquity of the Human Race.

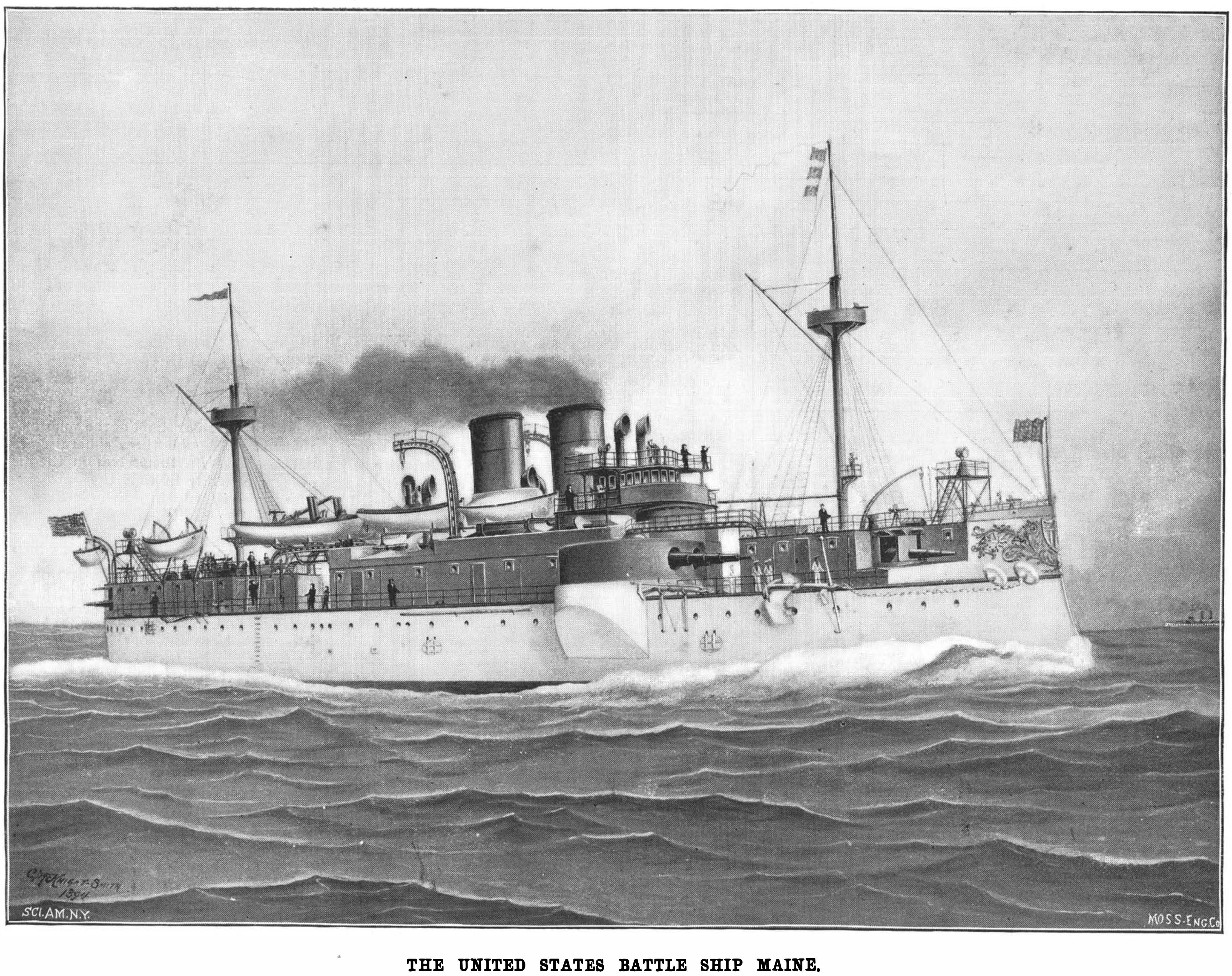
The Department of State, Washington, has received a dispatch from Minister Terrell, at Constantinople, announcing the results of American explorations now being conducted at the ruins of Niffer, near ancient Babylon. The expenses of the work are defrayed by an association of Philadelphia gentlemen formed under the name of the "Babylonian Exploration Fund."

The work began in 1886, and, except at occasional intervals, has been actively conducted. Dr. Peters and Prof. Heilpricht, of the University of Pennsylvania, began the work, and it is still continued by Dr. Peters. From 150 to 250 Arabs have been constantly employed.

In the number of tablets, bricks, inscribed vases, and in the value of cuneiform texts found, this American enterprise rivals, if it does not excel, in the opinion of the minister, the explorations of Layard at Nineveh and Rassam's excavations at Abu-Hatba.

Prof. Heilpricht remains at the museum in Constantinople, at the request of the Turkish government, translating inscriptions and arranging tablets, bowls, and vases used from 1,000 to 4,000 years before Christ.

Many tons of tablets, etc., have already been procured, and the enterprise has revealed an antiquity for the human race nearly ten centuries older than had before been acknowledged by Biblical students. The report of the minister is very long and full of details of interest to archæologists.



THE UNITED STATES BATTLE SHIP MAINE.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.................. $3 00
One copy, six months, for the U. S., Canada or Mexico................ 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year*.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, SEPTEMBER 29, 1894.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
SCIENTIFIC AMERICAN SUPPLEMENT
No. 978.

For the Week Ending September 29, 1894.

Price 10 cents. For sale by all newsdealers.

MAN AND VEGETATION.

While invention has produced many substances which in part replace wood and other organic materials, the fact remains that man is to-day almost as dependent for his comfort and very life on the vegetable world as were his ancestors in more primitive times. The anatomists have had long disputes as to man's place in the scale of food consumption, whether he is properly omnivorous or not. Whether carnivorous or vegetarian, his food derives its ultimate origin in the wonderful chemical decompositions and syntheses effected by the vegetable kingdom. The highest triumphs of synthetic chemistry have not yet succeeded in producing his food from the chemical elements.

The production of self-supporting aquaria, consisting of tanks of water in which plant life and fish life are so exactly balanced that there is a miniature self-supporting world within the four glass plates, has been a favorite scientific amusement with many. On our globe we see a similar thing in the relations of the animal and vegetable kingdoms. Unfortunately, man is not content with exterminating wild animals; he is not satisfied with utilizing for himself all vegetable nature, but he exterminates most recklessly the forests whose leaves are taking care of his own vitiated respiratory products.

The earth contains plant and animal life, each one taking care of the products of the life of the other kind. The animal expires carbon dioxide gas, the product of the combination of oxygen of the air with the carbon of the body. In a plantless globe this gas would constantly increase in the atmosphere, to the eventual deterioration of the air; but the plant life disposes of this product, separates the carbon from the oxygen, and still more wonderful, effects one of the most difficult of syntheses, and unites the carbon with hydrogen, producing vegetable substance of different kinds. The purification of the air by plants, owing to the enormous volume of the atmosphere and its relatively slow contamination, is of secondary importance to the production of plant substance. On the products of vegetation man depends for nearly everything, for food, raiment, and heat. Not content with reckless deforestation, he draws upon the accumulated stores of the preceding geological eras, and in burning coal, probably petroleum and natural gas, is drawing upon the remains of the vegetation of the carboniferous and other ages.

Plants by their vital power effect two specially difficult chemical actions—the decomposition of carbon dioxide gas, and then combine the separated carbon with hydrogen. Absolutely no practical way of doing these things has been as yet found by man. It is only by a laboratory experiment that either of these two reactions is carried out. It may be said that every steam engine depends for its fuel on decomposed carbon dioxide gas and every petroleum lamp represents the utilization of the decomposition and subsequent synthesis which we have spoken of. In the matter of food, man is still more dependent on the vegetable world. Very few artificially produced food products have ever been made, and these few may have their origin traced to some vegetable product. The glucose factories use a product of vegetation as the base of their operations. Until we succeed in bringing chemistry to a point of perfection hardly dreamed of by the most visionary, man will continue to depend upon the soil for his very life. He may selfishly feel that all this is of interest only for subsequent generations, but to every enlightened mind the reckless waste of vegetable resources, among which may be included coal, petroleum, and natural gas, is highly repugnant.

Science Notes.

Decoration of Aluminum.—Mr. W. Greune, according to Annales Industrielles, has invented a process of decorating aluminum, based upon the metal's property of uniting when hot with very finely divided carbon in order to form very durable and adhesive coatings. In order to apply the carbon to the surface of the metal, the most convenient method consists in spreading, with a brush, over the surface to be decorated, alcoholic or benzinic solutions of organic compounds, such as fats, oils, resins, etc., which are not very volatile and which are destroyed by heat and leave a deposit of very finely divided carbon. The objects thus prepared are heated to a dark red. They thus become covered with a layer of carbon intimately connected with the metal, and the shade of which varies with the mixture employed and the temperature to which the piece has been submitted. To the carbon composition may be added metallic salts that favor the decomposition and permit of varying the shade of the coating to infinity.

Preparation of Chromium.—From some new researches of Mr. Henri Moissan upon chromium, it results that, through the use of the intense heat produced by the electric arc, it is possible to prepare fused chromium in very large quantities. The product may be refined either by fused lime or by the double oxide of calcium and chromium.

The metal obtained under such circumstances is less fusible than platinum. It may be filed, it takes a beautiful polish, and is not attacked by atmospheric agents. It is attacked but slightly by acids and resists aqua regia and alkalies in fusion.

This preparation of chromium will permit of efficaciously studying the alloys of the metal. United either with aluminum or copper, it gives, in fact, some very interesting results.

Pure copper, alloyed with 0·5 of chromium, has its toughness nearly doubled, and the alloy, which is capable of taking a beautiful polish, alters less than copper does in contact with moist air.

Commercial Products Obtained from Sharks.—Sharks, says a writer in the Revue Scientifique, furnish quite a number of valuable products. Thus, the liver of the shark contains an oil of a beautiful color, that never becomes turbid, and that possesses medicinal qualities equal to those of cod liver oil. The skin, after being dried, takes the polish and hardness of mother of pearl. It is marbled and bears a resemblance to fossil coral. It is used by jewelers for the manufacture of fancy objects, by binders for making shagreen, and by cabinet makers for polishing wood. The fins are highly prized by the Chinese, who pickle them and serve them at the end of a dinner as a most delicate hors d'œuvre. A ton of fins usually brings (at Sydney) $140.

The Europeans, who do not yet appreciate the fins of the shark as a food product, are content to convert them into fish glue, which competes with the sturgeon glue prepared in Russia. This glue is employed for clarifying beer, wine, and other liquors. It is used also for the preparation of English taffetas, as a reagent in chemistry, etc. The teeth of the shark are used by the inhabitants of the Ellis Islands for the manufacture of weapons of war. As for the flesh of the shark, that, despite its oily taste, is eaten in certain countries. It is employed, also, along with the bones, in the preparation of a fertilizer. The Icelanders, who do a large business in sharks' oil, send out annually a fleet of a hundred vessels for the capture of the animal.

The Structure of Clouds.—Mr. Van der Mensbrugghe recently read before the Scientific Society of Brussels an interesting paper upon the structure of clouds, and of which Ciel et Terre gives the following abstract:

Much has been written, says the author, upon the question as to whether clouds are formed of hollow vesicles or small solid globules; but we now know various facts that dispel every sort of doubt upon the subject. Let us, in the first place, mention the most direct of these. It was announced in 1851 by Mr. Joseph Plateau, who had recourse to the process of F. Duprez for keeping a column of water suspended in a glass tube closed at the top, open at the bottom and of an internal diameter of fifteen or sixteen millimeters. Beneath the free surface of the liquid there was a vessel containing boiling water, whence continually arose a current of visible vapor. Under such circumstances the suspended liquid never lost its perfect transparency, despite the multitude of spherules of visible vapor that struck its free under surface, provided care was taken to wipe the external surface of the tube. Is this not a proof that the condensed vapor did not contain spherules filled with air, and that it was indeed formed of solid globules? In my opinion, says Mr. Van der Mensbrugghe, this experiment constitutes a very serious argument against the theory so often invoked of vesicles in the clouds.

Here, now, are some considerations, which are theoretical, it is true, but yet very plausible, that plead likewise in favor of the globular shape of the spherules that form the clouds. Although these spherules are extremely small, they sustain themselves in the air with so much the more facility in that they are surrounded by a very thick stratum in which the density continues diminishing toward the exterior, and that, according to the principle of Lord Kelvin, they evaporate so much the more rapidly in proportion as they are more tenuous.

If, on the contrary, the globules of the cloud are relatively large, they obey their weight; but, in falling, they traverse warmer and warmer strata of air, and consequently evaporate more and more quickly until they reach a diameter starting from which the resistance of the air prevents their ulterior fall.

We have, therefore, no need of supposing the larger or smaller globules to be filled with air in order to explain the suspension of the clouds in the atmosphere. Moreover, such suspension is merely relative, for the clouds change their form almost constantly, and this well proves either an evaporation or a fall of certain portions that constitute them.

Spontaneous Combustion of Cargoes of Coal and Cotton.—According to Mr. L. Hoepke, it is to a slow oxidation and to the resulting disengagement of heat that must be attributed the spontaneous combustion of cargoes of coal. The danger is so much the greater in proportion as the surface exposed to the air is wider. It is maximum with coal dust. The loading and trimming should, therefore, be so done as to avoid as much as possible the crumbling of the coal under

the influence of the ship's motion. The smallest vessels are preferable for the carriage of coal.

Mr. Hoepke does not believe in the possibility of the spontaneous combustion of cargoes of damp cotton. But it is possible that a spark falling accidentally upon a bale may remain ignited for weeks and afterward set fire to the mass. Greasy cotton, on the contrary, very easily takes fire spontaneously. The same is the case with flax, jute and tow. Stacks of hay, and bales of tobacco and hops are likewise liable to spontaneous combustion.

Electrolysis of Sulphate of Copper.—In a note recently presented to the French Academy of Sciences, Mr. A. Chassy states that if sulphate of copper in a hot state be electrolyzed, there will be obtained in a large number of cases a remarkable violet red deposit. At 100°, for example, with a current density of one hundredth of an ampere per square centimeter, a saturated solution of pure sulphate of copper gives upon a platinum electrode a beautiful deposit, which, examined under the microscope, exhibits magnificent crystals of a bright red, whose forms are derived from the cube and octahedron.

The deposit is not always homogeneous. If the temperature of decomposition be diminished, there will be obtained small reddish yellow crystalline masses of copper disseminated through the red crystals. The lower the temperature is, the greater will be the proportion of metallic copper. Thus, toward 40°, we obtain only a few isolated red crystals. An increase of the density of the current or a diminution of the concentration produces the same effect as a lowering of the temperature of the experiment. In all cases, in order to obtain the red crystals, a nearly neutral solution is requisite. The experiment succeeds as well with a liquid deprived of air through a prolonged ebullition.

Notes from the Antwerp Exhibition.

The Room of Honor, where their Majesties the King and Queen and other distinguished personages are received, was furnished by the French Chamber of Commerce in Brussels from the manufactories of France. It is not large, but is well lighted and handsome. The walls are hung with beautiful tapestry from the Gobelin works, and some more delicate in color and design from Beauvais. The upholstery is rich and of antique looking patterns. Fine Sevres vases stand about the room. A green one, adorned with enamel of gold, blue, green, and red in elaborate design, which ornaments the center table, has been presented to the Queen of Belgium. A very large vase of dark red marble, bronze, and gilt, was made at Barbedienne. A small crucifix formed of a gilt cross with the Christ cut from a piece of Indian jade hangs on the wall under glass. It cost $1,200. One of the gems of the room is a screen composed of two photographs on white silk. One has a purplish blue tint, the other a soft greenish-gray tone; both represent a youth and maiden with the possibilities of a romance within their grasp.

England makes very little attempt at an exhibition; but the case of platinum apparatus patented by Johnson Matthey & Co., of London, and the specimens of metals separated by its use, is valued at $100,000. A nugget of platinum weighs 157·5 ounces. An ingot of palladium, containing 1,000 ounces, was extracted from gold and platinum valued at $11,250,000. Besides these specimens there are glasses containing considerable quantities of the rare elements, silicon in steel gray crystals, osmium in pale blue grains, and a mass of iridium weighing 240 ounces. The standard meter rule and kilo weight adopted by the International Commission of Weights and Measures, composed of pure iridio-platinum, are in the case. The large platinum gold lined vessels for the concentration of sulphuric acid are valued at $18,800. This is the same exhibit shown in Chicago.

Across the Central Gallery hangs the word "Navigation," and below and far beyond it extends the fine display made by the principal great steamer lines. There are many models of their boats, each in its own glass case. The North German Lloyd's section is particularly interesting, and though more complete than some, may be given to illustrate the whole. It occupies two rooms; in one is a large map of the world placed in a horizontal position. On it all the company's routes are indicated by heavy lines, and on each little vessels are placed to show where their entire fleet is at a given time. They are all numbered and a key is given. In this room and the other there are beautiful models of twelve of their vessels. The upper part of the walls is decorated with views of the harbors which they enter, Rio Janeiro, Genoa, Bremen, Sydney, etc. On the wall there are also interesting statistics, among them these: The whole number of passengers carried by the line from 1858 to 1893 is 2,956,849. The corners of the room are filled with a promiscuous mass of wheels, lanterns, buoys, life preservers, etc. Relief representations of the shipyard at Bredow, near Stettin, of the Southampton Harbor and the docks there, and a similar one of Dunkerque are only second in interest to a visit in all three places.

A half section of a model of the man-of-war Victoria, perhaps ten feet long, is placed against a mirror, high above the floor, and has a raised platform beside it, from which a number of spectators are generally to be seen studying her complicated appointments.

The most ambitious industrial work shown in the small section devoted to educational exhibits consists of a pretty, well finished road cart and harness made at a reform school at Logne Pointe, Canada.

The Utrecht Life Insurance Company exhibits a library of 2,009 volumes concerning life insurance and the accessory sciences. They are in the Italian, Dutch, German, French, Latin, and English languages. The catalogue giving full titles contains some curious summaries of books, particularly of old ones. Here is an example: "Hayes, R. A new method for valuing of annuities upon lives. Shewing at sight, as follows: I. How many years, months, etc., purchase an annuity upon life, for any age, from 30 to 73 years, is worth, when money yields 4, 5, 6, 7, or 8 per cent interest. II. How much a year 100 l. is worth upon life for any of the aforesaid ages, etc. III. The value of the buyers' and sellers' chances. V. The present value of any annuity upon life, from 1,000 l. a year to one pound a year, for any age, from 30 to 73 years, when money is worth 4, 5, 6, 7, or 8 per cent. . . . X. The amount of 100 l. a year, if the payment is forborne for any number of years, under 31, at 5 and 6 per cent. Very useful in settling of accounts between executors and orphans. Together with many useful examples and instructions for valuing of single lives; two or more lives; lives taken in with other lives; reversion of lives; annuities in expectation; estates for any certain term of years, as freeholds, leaseholds, and reversions, without any decimals, etc. The whole being made easy to a common capacity. The second edition, corrected. London. 1746. 4to."

A Tyrolese log hut is an interesting part of the Austrian section. It is furnished in a quaint, primitive way, and has some old armor on the walls. But its chief object is to show the scenery of the Austrian Alps; this is done by three large pictures arranged in somewhat the same way that the so-called cycloramas are, though on a smaller scale. The views of glaciers, lofty peaks, with glorious clouds hanging about them, picturesque huts clinging to their sides, and lovely lakes at the foot, will hardly fail of sending some travelers thitherward.

Hungary makes her bid, too, to lovers of fine scenery by the attrative frescoes on the walls of her department. Her display of substances used in the tanning of leather occupies one side of the room. They come from long distances; there are oak bark, sumac, and acorns from Greece and Australia, and nutgalls from the Argentine Republic. The exquisite glass from Vienna is so delicate that in comparison with it that shown by other countries looks coarse.

Bulgaria has done well to send so large a collection of photographs of her scenery. It is so wild and beautiful that, in time, I believe it will be an important rival of Switzerland. She makes no mean display of her products—maize, rice, wheat, etc.—in this exhibition where the cereals are conspicuous for their absence. It has a great variety of useful minerals, too, including marbles, coal, gypsum, iron, copper, and salt. Carpets and furniture strong in texture and barbaric in color, and soft, delicate silk fabrics show the progress in manufactures.

A case of costumes overloaded with gilt and embroidery suggests that some of the people must be very fond of display.

The United States make a most humiliating exhibition. They occupy, the guide book says, 10,000 square yards of space, as much as Germany; but it does not seem to me that the pitiful little array of tobacco, varnishes, musical instruments from Lyon & Healy, in Chicago, the case of pills, the caligraph, steam radiators, some bathtubs, a few easy chairs, some bottles of whisky, alarm clocks, the bags of flour from Duluth, the drills from a Cleveland firm, and car wheels from Buffalo can possibly occupy most of that space, and yet this is a careful list of what is to be found under the American flag, though it does not include a large collection of cash registers of various patterns and sizes. They attract crowds, and probably will not go far to change the belief that the dollar is almighty in America—a belief, by the way, which intelligent Europeans hold with considerable tenacity.

The picturesque costumes that a few years ago added to the interest of a visit on the Continent of Europe have well nigh passed out of use, and, on the whole, there is greater sameness in the general aspect of the crowds here than there was in Chicago. The older Flemish women in lace caps with large ear-shaped flaps over the ears do their share in relieving the monotony, and some of the Dutch peasants are really quaint. Occasionally a party of them may be seen going about together; the men wearing loose black velvet trousers, short jackets, their hair cut square in the neck, and an indescribable expression of simplicity and unsophistication on their faces. The women look as if they had seen more of the world, and were out for a good time. Tightness is apparently with them a very essential element of beauty. The white embroidered cap, with high projecting crown, is drawn closely over the smooth hair; the six or eight rows of pink coral beads are tight enough about the neck to give a choking sensation. The short velvet sleeves fit tight enough above the elbows to make a little puff, and the bare arms are as red as impeded circulation and exposure to sun and air can well make them. A little shoulder shawl, laid in tight little folds, is fastened over their backs, and very ample petticoats complete the costume. This has, at least, the beauty of being old-fashioned in every particular; but some Dutch women combine the old and new, to the great disadvantage of both. This remark applies to those who wear the close-fitting gold helmet over the head, over that a lace cap with a deep, fluted ruffle at the back of the neck, and on top of all a modern bonnet with flowers and feathers.

A serious mistake, in my opinion, is made by many exhibitors in having no one in charge of their exhibits. Among the machinery, where most explanation is needed, scarcely any is to be had, except for a short time in the afternoon. Where there is anything for sale, and those places are numberless, there is no lack of service. During the last few days, lottery tickets are offered at every turn, and the quantity of money to be seen at every stand where they are sold indicates that there is no lack of purchasers. A. D.

The Precipitation of Metals from Solution by an Electric Current.

A searching investigation into the separation of metals from their dilute solutions has recently been concluded by F. Mylius and O. Fromm. The experiments concerned the phenomena occurring in the precipitation of one metal by another, as well as in the electrolysis of solutions. For the work as a whole we must refer our readers to the Berichte der Deutschen Chemischen Gesellschaft, xxvii., 1894, pp. 630-651. The London Electrical Review, however, gives the conclusions arrived at as regards precipitation by the electric current. They are as follows: 1. The heavy metals may be separated more or less easily from their dilute solutions in the form of black, porous, and apparently non-crystalline precipitates. 2. Silver and copper precipitated in this way may absorb or occlude hydrogen during the passage of the current, but the greater part of this gas escapes when the circuit is opened. 3. Silver and copper precipitates exhibit spontaneous change into the crystalline state, frequently accompanied by the evolution of hydrogen. 4. The conversion of the black into the crystalline modification is hastened by the action of metallic salts, acids, and oxidizing agents, the metals in this respect being analogous to the alloys. 5. The black variety of copper containing hydrogen is essentially different from Wurtz's copper hydride. 6. An electrolytic method of formation of copper hydride no more exists than does a process of preparing the same body by means of zinc. 7. The black precipitate frequently observed on the zinc of a Daniell's cell consists of a copper-zinc alloy. The same substance separates and is deposited on the copper plate when the cell is exhausted.

The Bowery Young Men's Institute.

This institution, located in a thickly populated section of New York at No. 222 Bowery, has for its motto "Aids to Self-Improvement," and aims especially to assist in the business education of young men between the ages of 17 and 35.

Instruction is given in the following subjects: Steam engineering, practical electricity, sanitary plumbing, carriage draughting, mechanical drawing, architectural drawing, freehand drawing, arithmetic, bookkeeping, penmanship, shorthand, typewriting, English grammar and composition, vocal music and glee club, and first aid to the injured.

A distinctive feature of this educational work is that the theory is taught to those who are getting the practical part of the subject in their daily work. Firemen are taught all the theory necessary for becoming engineers. Engineers are prepared to take charge of higher grade engines. Machinists are taught the mechanical drawing which they need in their work. Young men in offices are taught the commercial subjects. In this way the efficiency and commercial value of each student is increased for his present employer.

Connected with the institute is an excellent gymnasium and also a commodious hall, where lectures on practical topics are given.

Waterproof Cloth.

A textile fabric or cloth, of close texture, is subjected to the action of sulphuric acid of about 115° T., so as to partly parchmentize the fibers and more or less completely close the interstices without destroying the texture of the cloth. The excess of acid is removed by washing, with or without previous treatment with alkali, and the washed material is subjected to pressure between calendering rolls, whereby a finished appearance is imparted, and the closing of the interstices completed. The material may be suitably dyed.

THE OPTOMETER SKIASCOPE.

Dr. Sureau has recently presented to the scientific world a most ingenious apparatus designed for ascertaining in a positive manner the nature and the degree of the different anomalies exhibited by the eye (myopia, hypermetropia, astigmatism, etc.)

A normal or emmetropic eye, as we know, sees a distant object clearly; that is to say, the image of the latter forms with exactness upon the retina. In a myopic (near-sighted) eye the image is formed in front of the retina, and in a hypermetropic (long-sighted) eye it is formed behind; hence the use of divergent glasses for the correction of myopia and that of convergent ones for hypermetropia. Astigmatism is due to the fact that the power of the eye is variable in the different meridians, there being a maximum meridian of power and a minimum meridian of the same placed at right angles. In order to correct astigmatism, recourse is had to spherical glasses, and it is very important for the oculist to determine the exact position of the maximum meridian in order that he may be able to give the correcting glasses the proper inclination.

The examination of an abnormal or ametropic eye, therefore, constitutes a long and difficult operation, and one that through that fact is subject to error. Dr. Sureau renders it rapid and easy, and, it may be said, of almost absolute certainty, with his apparatus, which registers the observations automatically. It consists, in the first place, of an optometer formed of three vertical, parallel wheels, movable around a horizontal axis. One of them carries 18 cylindrical glasses—9 convex and 9 concave—numbered: 0·5, 1, 1·5, 2, 2·5, 3, 4, 5, 6.

The second carries 18 spherical glasses—9 convex and 9 concave—numbered: 0·5, 1, 1·5, 2, 2·5, 3, 3·5, 4, 4·5.

The third carries 7 additional glasses designed for strong ametropias, and numbered: + 5, + 10, + 15, − 5, − 10, − 15, − 20.

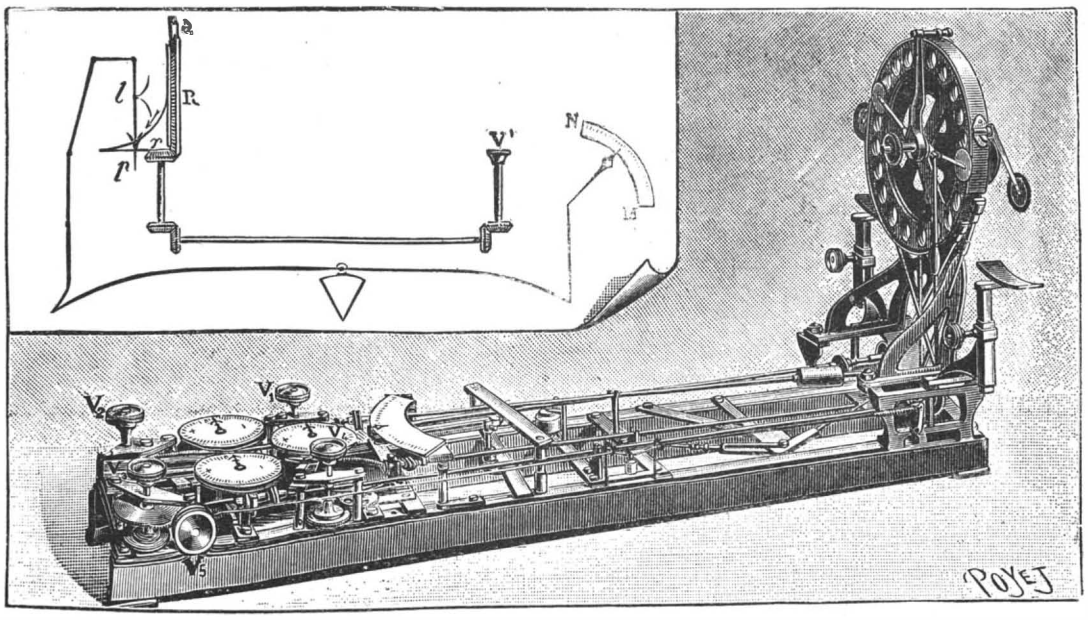
The sign + relates to convergent glasses and − to divergent ones. The two series of glasses are separated on each wheel by two orifices. We have thus a complete optometer, with which the physician will be able to measure the most diverse anomalies.

The eye is placed in a fixed position, so that any one of the glasses of the optometer may be passed in front of it. Each wheel is connected, through a mechanism, with a needle that moves over a dial so divided that the number in front of which the needle stops corresponds to the number of the glass placed in front of the eye of the subject. On another hand, a button placed under the hand of the observer affords a means, through the intermedium of levers, of maneuvering the wheel at a distance.

A peculiar mechanism permits of registering the degree of inclination of the cylinders necessary in the determination of astigmatism. To this effect, each of them is set into a toothed wheel, a, which engages with the teeth of a wheel, R, so that the rotation of the latter causes all the cylinders to turn at the same angle. Behind, there is a piece against which bears a lever that communicates with the needle of a quadrant, M N. On another hand, there is arranged a rod connected on one side with the wheel, R, through a toothed wheel, p, and, on the other, a button, V'. If a rotary motion be given to this button, it will be transmitted to R; that is to say, to the cylinders, and, at the same time, to the needle of the quadrant. This needle will indicate, very accurately in degrees, the amplitude of the angle described by the cylinders, and, consequently, their inclination upon the horizon.

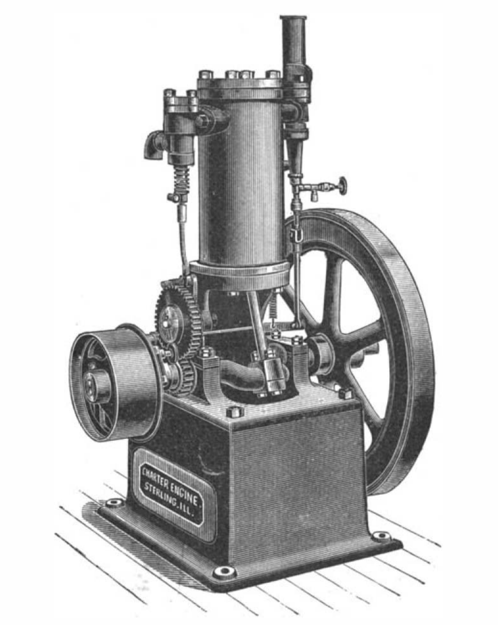
The adaptation of this mechanism to the optometer permits of maneuvering it at a distance. Under such circumstances the skiascopic method for the examination of the eye is all indicated. This justifies the name of the instrument—the optometer skiascope. The modus operandi is as follows:

A pencil of luminous rays is projected into the eye of the subject, placed behind the optometer, with the ophthalmoscope, while, at the same time, the different buttons of the apparatus are revolved according as need be.



SUREAU'S OPTOMETER SKIASCOPE.

The oculist then ascertains whether the entire pupil is illuminated at once or only progressively. If the former is the case, the eye is myopic by one diopter. If the illumination is progressive and the luminous zone moves in the same direction as the mirror, the eye is myopic by more than one diopter. If the contrary is the case, the eye is normal or hypermetropic.



THE CHARTER GAS AND GASOLINE ENGINE.

Astigmatism is distinguished by the persistence of a shadow in a meridian, while in the perpendicular meridian the illumination will be total. After making these observations, it only remains to read the dials in order to write the prescription for eyeglasses. The operation is performed very rapidly, and with mathematical precision. So the use of this instrument is particularly indicated in all cases in which it is necessary to make visual determinations upon a large number of subjects, and it is to be hoped that it will soon be utilized by the ministers of war and of the navy, in both of which branches of the service it will render surgeons great services through a great saving in time.—La Nature.

Dr. Francis Henry Underwood.

Dr. Francis Henry Underwood, United States consul at Edinburgh, died in that city, August 8, from blood poisoning resulting from a carbuncle on the back of the neck. The Scotsman, of the above city, has a long and interesting sketch of the life and labors of Dr. Underwood. He was born at Enfield, Mass., on January 12, 1825. He was educated in Amherst, and at the age of 16 was left dependent upon his own personal exertions. Starting life as a schoolmaster in Kentucky, he afterward entered upon a legal training, and was admitted to the bar.

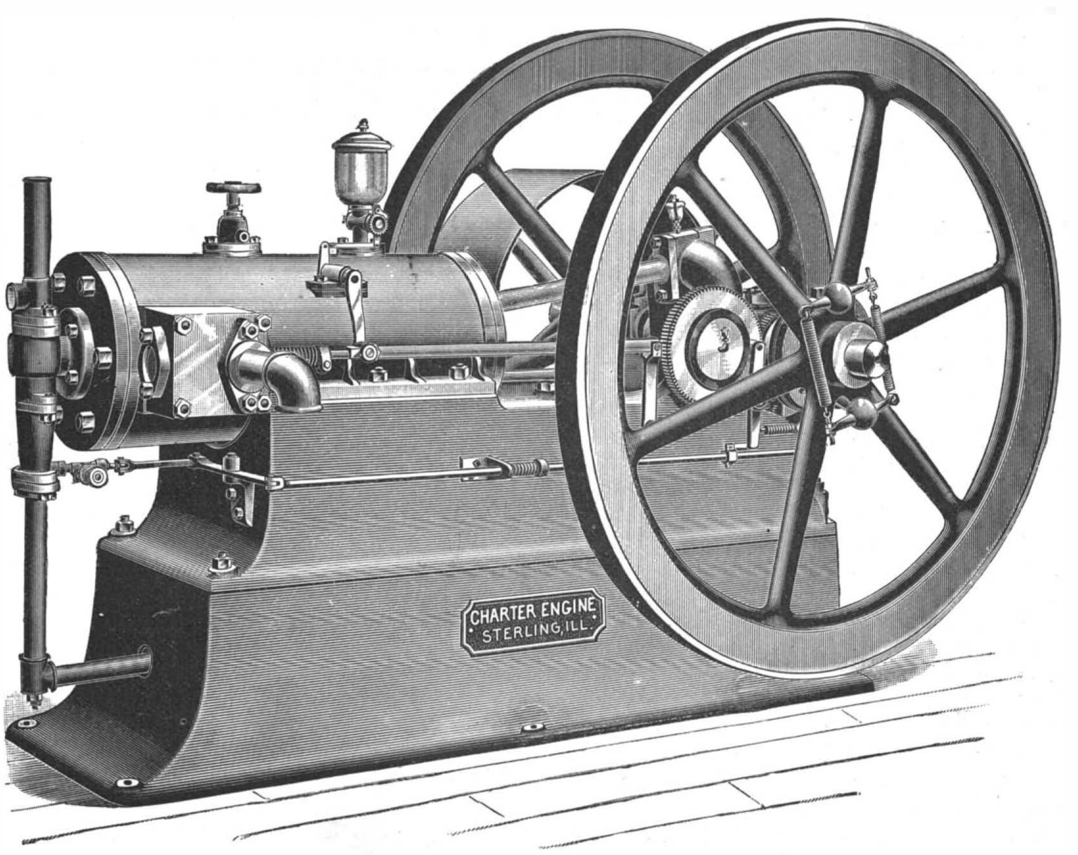
It was as a brilliant man of letters, says the Scotsman, that Dr. Underwood was best known, and will always be remembered. Though his studies were mainly in English literature, his writings cover a wider field. In his own person he constituted an addition to the long and honored roll of American citizens who have shown how felicitously eminence in literature may be combined with high diplomatic talent.

THE CHARTER GAS AND GASOLINE ENGINE.

The illustrations show two constructions of the Charter gas and gasoline engine, manufactured at Sterling, Ill, by the Charter Gas Engine Company, one being the double flywheel construction followed for the large sizes only and the other the vertical, made in but one size, viz., 1¾ indicated, 1¼ actual horse power.

The only change made in this engine since January, 1890, has been in operating the exhaust by a cam instead of an eccentric, the cam motion being shown in the larger cut. This has proved to be an improvement in facilitating the quiet working of the machine, as the motion is much more even than heretofore. This motion had been previously in use on the vertical engine, and has now been applied to the horizontal for all purposes. This engine uses gas, either manufactured or natural or producer gas, as preferred, and also gasoline, and in the use of the last named fuel its simplicity and safety have been attested by years of highly successful practice.

It is not affected by cold or changeable weather, and does not depend upon the temperature of the air or its degree of saturation to get the gasoline into the cylinder.



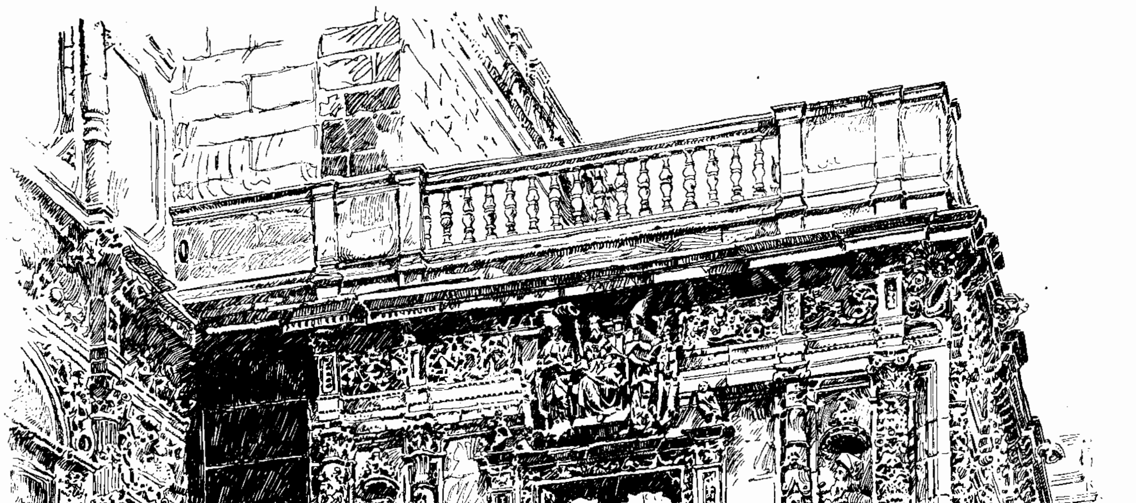
THE CHARTER GAS AND GASOLINE ENGINE.

Effect of Great Cold on Animals.

Pictet, the French chemist, finds by subjecting animals and insects to the intense cold obtainable from liquefied atmospheric air that animals show a wonderful power of resistance to its effects. A dog placed in a copper receiver at a temperature of —60° to —90° C. showed a rise of bodily temperature of 0·5° in ten minutes, and after an hour and a half had only lost 1°. A little later, however, nature gave up the struggle, the temperature fell rapidly, and the animal died suddenly. Insects resist a temperature of —28° but not —35°, while myriapods live down to —50° and snails to —130°. Birds' eggs lose their vitality at —2° to —3°; ants' eggs at 0°. Infusoria die at —90°, while bacteria are still virulent at —213°. This last fact is, perhaps, the most significant of all.

A PORTION OF THE HOTEL DE VILLE, SEVILLE, SPAIN.

Seville, situated on the left bank of the Guadalquivir River, 355 miles south-southwest of Madrid, is one of the most picturesque and interesting cities in Europe. Its cathedral, second only to St. Peter's at Rome, as regards size; the Moorish Giralda, the bell tower of the cathedral; and the Alcazar, the magnificent palace which is the chief relic of the Arab domination in Seville, are all world-renowned objects of interest. Hardly less interesting is the Casa del Ayuntamiento, the town house, or Hotel de Ville, as it would be called north of the Pyrenees. This beautiful Renaissance building offers a pleasing contrast to the Moorish edifices which abound in the old city. The Ayuntamiento was begun by Herrera, the Spanish architect, in 1545. The facade is divided into two unequal parts, the smaller of which contains an open porch or vestibule, as shown in the illustration, and is covered with a profusion of ornament that suggests the rich facade of the Certosa of Pavia. The other portion of the front is without ornament from the ground to the first story, along the front of which runs a series of open arches supported by columns. The rich carving is executed in a style called plateresque, which rather uncouth term is used to denote work in stone that resembles the art of the silversmith. Owing to the softness of the climate, the rich carving still exists in undiminished splendor. For our engraving we are indebted to the Engineering Record.



HOTEL DE VILLE, SEVILLE, SPAIN.

The Vaccination of Land.

Some of the most extraordinary agricultural experiments ever undertaken, considered both practically and scientifically, are described in Le Genie Civil. Every one who has ever owned a lawn knows that to plow the ground at intervals, and raise a crop of certain vegetables, improves the subsequent growth of grass; and a drive through the suburbs of any large city will show lawns undergoing this treatment, sometimes with a crop of potatoes, sometimes with beans, according to the notions of the owners, or their gardeners. The process by which this alternation of crops improves the soil has never been very clearly explained. Most people suppose that the repeated digging up of the earth, to plant the potatoes, and harvest the crop, is the secret of the success of the treatment, but chemists have fancied for many years that, in such rotations of crops, one set of plants might have the power of absorbing nitrogen from the atmosphere, and conveying it to the soil. With this idea, a long series of experiments was carried out fifty years ago, by the greatest chemists in Europe, who analyzed various plants, the air in which they grew and the soil, before they were planted, during their growth, and afterward, and came to the unanimous conclusion that the absorption and storage of nitrogen by growing plants was an impossibility.

For all this, farmers continued to observe that certain plants, particularly of the leguminous tribe, such as clover, lucerne, sainfoin, and some others, instead of exhausting the soil, seemed to enrich it, so that, even after the leaves and stems had been cut and carried away, the roots alone, left in the ground, sensibly increased its fertility. Analysis showed that these roots contained a considerable quantity of nitrogen. If, according to Boussingault, Lawes, Gilbert and others, it was impossible that this nitrogen should be derived from the atmosphere, it must be drawn from nitrogenous matters in the soil. The inference would be, in this case, that nitrogenous manures would be beneficial to crops requiring so much nitrogen for their growth; yet it is well known to farmers that these plants not only derive no benefit from nitrogenous fertilizers, but are injured by them, while, although through the nitrogen contained in their roots they improve the soil greatly for succeeding crops of other plants, they injure it for themselves; and leguminous crops, cultivated too long in the same ground, become sickly. It was not until a few years ago that science and observation were reconciled, by the persistent investigations of MM. Hellriegel and Willfarth, who demonstrated beyond question the fact that the leguminosæ do, in growing, absorb large quantities of nitrogen from the air, but with the singular condition that the absorption of nitrogen begins only with the appearance of a diseased state, which is marked by the development of tubercles, about the size of a millet seed, on the roots, and is, apparently, caused by minute animals, which are always found in the tubercles, and seem to give the plant the nitrogen-absorbing power. Further investigations showed that the young, healthy plants lived on the nitrogen already contained in the soil, and that it was not until this was exhausted, and the plants began to suffer, that the nitrogen-absorbing excrescences made their appearance; and proved, also, that the tiny inhabitants of the tubercles were, as a rule, confined to one species of plant, the acacia microbe, for example, refusing to live on the bean, or the clover microbe on the lentil.

It is evident that a plant capable of absorbing nitrogen, which is a costly as well as indispensable adjunct to farming, and of storing it up in the soil for its master's profit, is a valuable possession; and, as only diseased plants have that property, it is obvious that it is desirable to spread the nitrogen-storing disease. With this view, several skillful farmers in France and Germany have, within the past two or three years, been trying experiments, by "vaccinating," as they say, fields of leguminous plants, by sprinkling them with earth in which tuberculous plants have been growing, or water in which they have been soaked; and the results have been extraordinary. Analysis has shown that a single crop of tuberculous leguminosæ, if the tops are plowed in, adds to the soil from five to twelve thousand pounds of nitrogen, worth from eighteen to forty-five dollars, to the acre; and even when the tops are cut and carried away, there is enough nitrogen left in the roots to insure a good crop of cereals on the same ground the next season, without other fertilizer. In 1890, a tract of old, peaty soil was "vaccinated" with a ton and a half to the acre of earth from a diseased field. Besides this, five hundred and twenty pounds to the acre of scoriæ from a dephosphorating furnace were spread over the ground, and about a thousand pounds to the acre of kainite, but very little nitrogenous manure. The tract was then sown with clover, which produced nearly three tons of hay to the acre. The next year, a virgin peaty soil was treated with half a ton to the acre of sand, from a field which had borne a crop of "serradelle," a small leguminous plant, unknown to us. The sand was harrowed in. No other manure of any kind was put on. The ground was sown with winter rye. In May, thirty-five pounds to the acre of serradelle seed was sown among the rye. The rye produced a good crop, and, after the harvest, the serradelle, which had absorbed and fixed about sixty pounds to the acre of atmospheric nitrogen, was plowed in, as green manure. The next year, the land was planted with potatoes, and similar potatoes were planted in neighboring fields, which had not had the new treatment, but were simply enriched with barn yard manure. At the harvest, the yield from the vaccinated fields, which had received no other manure, was from twenty-eight to sixty-two per cent greater than from the manured fields, according to the variety planted. The most surprising result from the treatment appears, however, to have been obtained in Prussia, where a tract newly brought under cultivation was divided, and part vaccinated with earth from a lupin field. The whole was then sown with lupins; and the yield from the vaccinated portion was five and one-half times as great as that from the other portion, for equal areas.—Amer. Architect.

Return of the Peary Expedition.

All of the members of the Peary main and auxiliary expeditions, with the exception of Messrs. Peary, Lee and Henson, returned to St. John's, N. F., Sept. 15. Lieut. Peary and his two companions will remain at the headquarters, Falcon Harbor, to conduct their explorations next year.

On October 31, 1893, an immense tidal wave swept away half of the oil which was used for heating and lighting and destroyed the launch and dories. The winter was spent in preparations for the inland ice journey to Independence Bay, which began on March 6, with a party of eight men, twelve sledges and ninety-two dogs. The burros and carrier pigeons were useless. The party arrived at Anniversary Lodge with twenty-four dogs and no sledges, having advanced only 134 miles in thirty-one days. The party was divided, and Peary, Baldwin, Entrikin and Clark pushed on. At last, when it became evident that Independence Bay could not be reached in the summer of 1894, the return trip was begun. In the equinoctial storm, which lasted for four days, the explorers suffered from the intense cold, the temperature at times being as low as 60° below zero, while for thirty-four consecutive hours the wind blew forty-eight miles an hour. It is believed that this weather is the worst to which any Arctic explorers have been subjected.

Though the expedition has ended in failure as regards the main object of the trip, still good work was done in surveying and mapping out quite an extent of hitherto unknown coast line. Messrs. Peary and Lee are also the first white men to see, measure and locate the iron meteorite near Cape York. It is expected that this meteorite will be brought home next year. The auxiliary expeditions made some valuable explorations in the Carey Islands, at Cape Faraday and at Clarence Head.

Logarithms.

An expert engineer in a New England city rendered a bill to a corporation who had employed him to write a technical report. The amount of the fee was large, the corporation refused to pay it, and the claim was carried into court.

During the trial the counsel for the corporation sought to belittle the expert's work, raising questions as to his experience, and, in fact, to prove that his labor would have been amply rewarded with a few dollars a day.

"How did you reach this result?" asked the lawyer, referring to a certain calculation which had involved the use of logarithms.

"I consulted Napier's table and"—but he got no further.

"You consulted Napier's table, did you?"

"Yes."

"Do you mean to tell this court that you, an expert, had to resort to a published table? Did you prove the figures of that table?"

"No; but they have been proved. They are considered to be accurate by every scientific man."

"Why do you not work out your own table of logarithms? Is it not because you are unable to do so?"

"It is not. I am perfectly capable of preparing such a table, but it would have taken too long a time to do so, and so I consulted the standards."

"In order to prove your calculation as well as your capabilities in this matter," continued the suspicious lawyer, "I will now ask you to prepare a table of logarithms."

"Here and now?" inquired the plaintiff. "I fear it will consume too much of the court's time."

This seemed to confirm the lawyer's doubts, and so he insisted the more upon having a complete table of logarithms prepared.

The plaintiff smiled maliciously, took paper and pencil and began his work. In about five minutes the lawyer asked him if he had finished. The plaintiff shook his head and continued at work. Ten minutes passed by and again the question was put:

"How nearly finished are you?"

"Very far from finished," remarked the plaintiff.

"Well, may I ask how long it will take you to prepare a table such as Napier's? You seem to be very slow about it."

The expert hesitated a little and then replied: "I estimate that, working alone, I might be able to complete it in about fifteen years, working day and night. It took Napier and five assistants seven years to prepare his table, but I am less familiar with the calculation than he was, and, as you say, work slow. Still in fifteen years I think I can complete it."

It is unnecessary to say that the lawyer was not a little taken aback by the answer, which enlightened him a trifle on the subject. He withdrew the questions, and eventually the expert won his case.—New York Herald.

Dentistry in China.

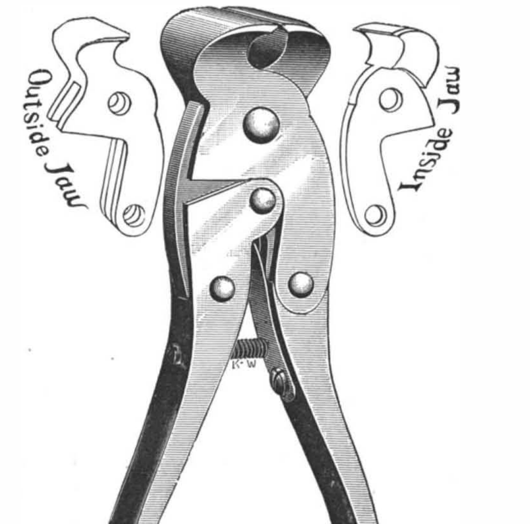
In the department of dentistry the Chinese have, strange to relate, anticipated by centuries the profession in Europe and America in the insertion of artificial teeth. Utilizing the femur of an ox, and sawing a circle of half or three-quarters of an inch from the shaft, a section of this circle is used sufficient to fill the vacant space in the mouth. The section of bone is then dressed with a file, so as to imitate the teeth to be replaced, and through holes drilled in each end, copper wires are passed to fasten it to the adjoining teeth. These artificial teeth are designed more for good looks than for purposes of mastication, and since the cost of inserting three or four teeth amounts to about twenty-five or thirty cents, this means of remedying uncomely defects is within the reach of all.

American and English dentists of high standing have practiced their profession in Hong-Kong, Shanghai, and other cities open to foreign commerce, and have employed Chinese young men to assist in the mechanical part of the work. With the talent for imitation for which the race is noted, these young men have not been slow to avail themselves of the opportunity of learning the more delicate parts of the work performed by the dentist himself. A number of these young men have become successful practitioners among their own countrymen, and with foreign instruments and material, are superseding the crude and unsatisfactory work of the native artists. They have not yet attained to the skill in the treatment of diseases of the mouth which requires scientific knowledge, but that will come in time.

The theory that toothache depends on the presence of worms in decayed teeth is universally believed, and is demonstrated by a process peculiarly Chinese, and which was investigated some years ago by Dr. Rogers, a dentist of Hong Kong, and myself. The native operator holds back the lips with a wooden spatula while he works around the offending tooth with a pointed instrument until there is a flow of saliva and blood; adroitly turning the spatula and placing the other end in the mouth, a piece of delicate paper attached to one side is moistened by saliva and the worms, confined under it, are liberated, and become mixed up in bloody saliva. With a pair of forceps the operator picks them out and satisfies the patient.—J. G. Kerr, Dental Register.

A POWERFUL CUTTING NIPPER.

It will be seen by the arrangement of the jaws of this nipper that it gives great power with rigidity. It forms one of an extensive line of fine tools, such as calipers, dividers, gauges etc., made by the J. Stevens Arms and Tool Company, of Chicopee Falls (P. O. box No. 280), Mass. The nipper will cut wire

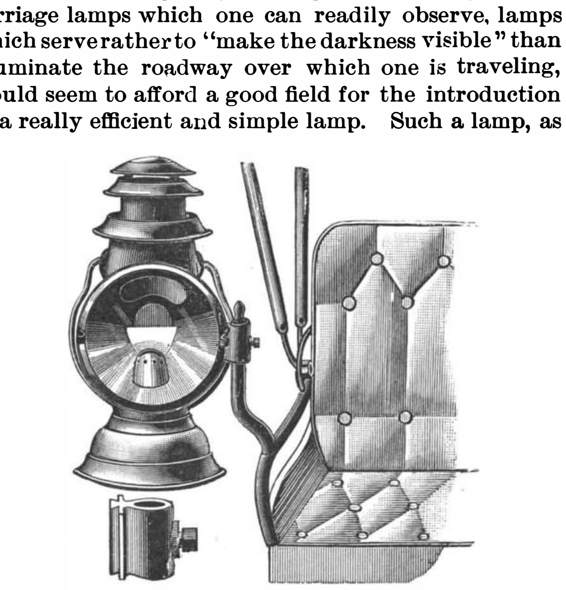


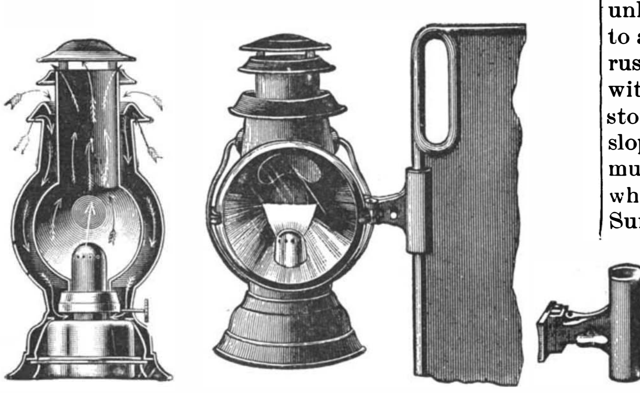
A POWERFUL CUTTING NIPPER.

at either extreme of the jaws without the opposite end closing faster than the cutting end. It is well adapted for cutting music wire and other severe work.

A CONVENIENT CARRIAGE LAMP.

The number of poorly burning, smoky, badly located carriage lamps which one can readily observe, lamps which serve rather to "make the darkness visible" than illuminate the roadway over which one is traveling, would seem to afford a good field for the introduction of a really efficient and simple lamp. Such a lamp, as





THE "DIETZ" TUBULAR DRIVING LAMP.

made by the R. E. Dietz Company, of No. 77 Laight Street, New York City, is represented in the accompanying illustrations. Its tubular construction, with the double sides forming an air chamber down which the air passes to the flame, as shown by the arrows in one of the views, insures a perfect combustion unaffected by wind or the jar of travel, and the reservoir is designed to hold a ten hours' supply of kerosene, without refilling. The front of the lamp consists of a beveled, moulded lens, and at its back is a small lens of ruby glass giving a brilliant point of crimson light at the rear. One of the views shows an attachment for securing the lamp to the left side of the dash, and another illustrates a fitting with which it may be placed on the side brackets of a carriage. The lamp can be attached in a moment to the front or side of the dash, or to the bracket, and the light is thrown straight ahead.

The Gohna Flood.

The story of the Gohna landslip and its sequel is so extraordinary that it deserves to be told in some detail, now that the bursting of the dam and the flooding of the valley have taken place in the exact manner and almost on the exact day which had been foreseen. We are enabled to do this through the careful investigations of Mr. Thomas H. Holland, published in the latest issue of the records of the Geological Survey of India. The scene of this curious story is in a Himalayan valley, in the district of Garhwal, between the sacred city of Hardwar on the Upper Ganges and the Tibetan frontier. It is a land of immense mountains, separated by valleys so narrow that they may almost be called ravines. The chief of these is the valley of Srinagar, through which runs the river Alaknanda, an object of profound reverence to devout Hindus. A tributary of this river is called the Birahi Ganga, and eight miles above its junction with the larger stream is the small village of Gohna, situated 160 miles from Hardwar. Close to Gohna was a hill called Maithana, precipitous in form, and composed of dolomitic rock. On September 6, 1893, almost exactly a year ago, toward the close of the rainy season, a tremendous landslip took place here, nearly the whole hill falling into the valley and damming the stream so as to form a long, deep lake. "Falling," writes Mr. Holland, "continued for three days with deafening noise and clouds of dust, which darkened the neighborhood and fell for miles around." The falls continued at intervals for several months, and at the time of Mr. Holland's visit last March "a day's rain or fall of snow was always succeeded by falls—blocks of several tons came bounding from ledge to ledge for more than 3,000 feet over the broken hill face with a low rumbling noise and the production of clouds of dust." In March the dam formed an exposed surface of 423 acres, but the river had already become a lake of two and three-quarter miles in length, and this was growing steadily, the dam being, of course, gradually submerged by the mounting waters. At that time the rate of rising was six inches a day, but with the melting of the snows in the hot season it was known that the rise would be more rapid.

The geologists, however, were not content with vague prophecies such as must have occurred to unaided common sense. The question for them was, At what precise time will the lake reach the top of the dam, and what will then be the precise course of the liberated waters? The answer to these questions offers a curious instance of exact scientific prevision, worthy of being put on record as such, and of high practical value as an instance of what is done for the people of India by a government that has at command the best scientific ability and the power of making full use of it. At the time of Mr. Holland's visit, the lake was less than three miles long, and before it could overflow its length must reach seven miles. Yet the date was exactly calculable, as was the course of the water after reaching the limit. "The lake," he wrote, "will be full and will overflow the barrier about the middle of August. Means of recording by instantaneous photographs the effects of the water on the dam are being carefully arranged by the government of the Northwestern provinces."

Again, speaking of the point at which the overflow would begin, the writer said, "When full the lake will, unless a cutting is made, overflow at the point referred to as 5,850 feet above the sea level; and the stream, rushing down an incline of 11 degrees, will rapidly cut with increasing head a channel in the mud and loose stones, until its speed is checked by the reduction of slope and the exposure of large blocks of dolomite which must occur below at no great depth." This is just what has now occurred. The water reached the top on Sunday morning, August 26, and by midnight had begun to escape in great volume. The heavy rush took place at night, and by 4:30 A.M. some 320 feet of water had escaped, the lake sinking to a quarter of its maximum size in that short space of time. It can easily be imagined that the rush of water down the valley was prodigious, and we need not be surprised to read that great destruction of buildings took place between Gohna and Hardwar. But, in spite of this tremendous outburst of force, no lives appear to have been lost, either in the valley or in the towns exposed to the water, though a column six feet deep is reported to have made its swift way through Hardwar. The administration had exerted itself splendidly, and its work was crowned with complete success. Telegraphic warnings had been flashed down the valley, and every man had been told beforehand exactly what to expect. The warnings were listened to, and every human being appears to have kept safely out of the way.—London Times.

Correspondence.

Fruchtzucker.

To the Editor of the SCIENTIFIC AMERICAN:

I beg you to convey to your readers through your columns that the fruchtzucker received by the Van Bibber Roller Company from Dr. Follenius (mentioned in the SCIENTIFIC AMERICAN of August 25) was another article than that which has been so highly spoken of in the American press throughout the United States, and which will absolutely not crystallize. This circumstance has in the meantime been explained to the V. B. R. Company, who will no doubt corroborate my assertion. Thanking you for your courtesy in giving publicity to this letter, I remain, yours, etc., S. H. ROSENBLATT.

New York, September 14, 1894.

Artichokes.

To the Editor of the SCIENTIFIC AMERICAN:

I want to say to farmers, plant less corn and more root crops for winter food for stock. I have cultivated and fed the white Jerusalem artichoke four years. They excel other root crops by their not being injured by freezing and thawing in the ground during winter. They need not be gathered and stored away as other roots, thus saving a great amount of labor. They withstand either dry or wet weather better than other crops and can be planted either in spring or fall. The way we feed them to hogs is just to turn them in when the tubers are matured and let them root the tubers from the ground. Cows, calves, and colts winter nicely on them. For these we plow out and pit for winter feeding. After the first planting there are always enough tubers left in the ground to produce the next crop. ELI HEATON.

Russiaville, Ind.

A Proposed Ship Canal.

To the Editor of the SCIENTIFIC AMERICAN:

Of the many plans which have been proposed for ship canals between the Hudson and the Great Lakes, none, so far as I have learned, embraced the features of the following, which has to recommend it that it is the shortest and has the fewest locks, as well as that it passes the summit at the lowest point.

Mr. McAlpine's report, made to the Oswego Board of Trade, some years ago, gives the distance by his proposed canal from West Troy to Lake Ontario at Oswego as 191½ miles. The distance by this proposed route from a point eight or nine miles south of West Troy, below Albany, would be about 166 miles—thirty-three miles shorter.

Our plan is substantially this: Make Lake Oneida the summit and use it as our summit reservoir, and enter the Hudson near Albany, or rather south of it, near where the Delaware and Hudson Railroad curves to the west. The section extending from the Hudson inland would join the Erie Canal at or near Schenectady, and would be as straight as it could be made, the distance being between these points sixteen or seventeen miles, instead of thirty, as at present by way of West Troy and the Erie Canal. From Schenectady the line would follow the Erie Canal to Utica. Thence a straight cut would be made to Lake Oneida, from the western end of which the canal would be excavated to Lake Ontario, joining it at or near Oswego.

We avoid crossing the Mohawk by keeping to the south of it. We avoid locking up sixty or seventy feet, going east from Lake Oneida, as in Mr. McAlpine's plan, by deep excavations from Little Falls, or near there, to the lake and passing beneath the "long level" of the Erie Canal from sixty to eighty feet. The rise from the Hudson to Schenectady, being about 200 feet, would necessitate twenty locks, and about the same number would be required from there to the point where we would reach our long level at Little Falls or near there, to and through Lake Oneida to the first lock beyond, a distance of from sixty to seventy miles.

There would be needed six or seven locks between Lake Oneida and Lake Ontario. The present outlet of Lake Oneida would be closed and Oswego River would be left alone, except to feed the canal. At the points where the canal enters and leaves the lake, gates would be placed to accommodate the varying height of the water.

Oswego Harbor would require deepening to accommodate boats of twenty feet draught, provided our canal passed boats of that size.

The prism of the proposed canal would be large enough to pass any boat that could pass the Welland Canal.

The question of water sufficient for the needs of the canal is satisfactorily settled by this plan, Oneida Lake furnishing the supply to pass the summit both ways. The demands west of the lake are supplied in part by Oswego River and east of the lake by the Mohawk. There would be some very heavy excavations on this line, but none, I believe, deeper or but little deeper than on the Suez Canal.

There can be no doubt that there exists a most urgent need for a ship canal from the Hudson to the Great Lakes, and we believe that this route is practically at the only point where one can be built. In calculating the benefits that would follow from a ship canal, one would be the opening of ocean transit to the heart of the continent by way of the port of New York. Another would be that the chances of shutting off communication between the East and the West by railroad strikes would be materially lessened, if not entirely removed.

As to the cost, I have made no estimate, but I do not doubt that it would cost to construct the canal proper, not taking into account the improvement of Oswego Harbor, $150,000 000, perhaps more. But this is pure guess work. If it be thought best to have a waterway entirely within the United States, then the expense of a canal around Niagara Falls—from La Salle to Lewiston—would be a large additional expense.

It is claimed that a large percentage of the ocean freight is carried in boats of fourteen feet draught and less. We would regulate the depth of the proposed canal, if entirely within the United States, to pass any boat drawing fourteen feet in salt water.

Elmira, N. Y. IRVING BOARDMAN.

What Dr. Lardner said about Transatlantic Navigation.

It has been frequently said, and it is generally believed, that Dr. Dionysius Lardner publicly asserted before the voyages of the Great Western and Sirius were accomplished facts, that a steam voyage across the Atlantic was a physical impossibility. What he did say was, however, quite different, viz., that such vessels could not be made a paying investment for such a voyage without government assistance or a subsidy, in the then state of steam navigation.

He says:* "It cannot be seriously imagined that any one who had been conversant with the past history of steam navigation could entertain the least doubt of the abstract practicability of a steam vessel making the voyage between Bristol and New York.

"A vessel having as a cargo a couple of hundred tons of coals would, cæteris paribus, be as capable of crossing the Atlantic as a vessel transporting the same weight of any other cargo. A steamer of the usual form and construction would, it is true, labor under comparative disadvantages, owing to obstructions presented by her paddle-wheels and paddle-boxes; but still it would have been preposterous to suppose that these improvements could have rendered her passage to New York impracticable. But, independently of these considerations, it was a well known fact that, long antecedent to the epoch adverted to, the Atlantic had actually been crossed by the steamers Savannah and Curacoa. . . . Projects had been started, in 1836, by two different and opposing interests, one advocating the establishment of a line of steamers to ply between the west coast of Ireland and Boston, touching at Halifax, and the other a direct line making an uninterrupted trip between Bristol and New York. In the year 1836, in Dublin, I advocated the former of these projects, and in 1837, at Bristol, at the next meeting of the British Association, I again urged its advantages, and by comparison discouraged the project of a direct line between Bristol and New York. When I say that I advocated one of these projects, it is needless to add that the popular rumor that I had pronounced the Atlantic voyage by steam impracticable is utterly destitute of foundation."

The meeting took place August 25, 1837, and the report of the Times' special reporter, which appeared in that paper on the 27th, says:

"Dr. Lardner said he would beg any one, and more especially of those who had a direct interest in the inquiry, to dismiss from their minds all previously formed judgments about it, and more especially upon this question to be guarded against the conclusions of mere theory; for if ever there was one point in practice of a commercial nature which more than another required to be founded on experience, it was this one of extending steam navigation to voyages of extraordinary length. He was aware that, since the question had arisen, it had been stated that his own opinion was averse to it. This statement was totally wrong; but he did feel that great caution should be used in the means of carrying the project into effect. Almost all depended on the first attempt, for a failure would much retard the ultimate consummation of the project.

"Mr. Scott Russell said that he had listened with great delight to the lucid and logical observations they had just heard. He would add one word. Let them try this experiment with a view only to the enterprise itself, but on no account try any new boiler or other experiment, but have a combination of the most approved plans that had yet been adopted.

"After some observations from Messrs. Brunel and Field, Dr. Lardner, in reply, said that he considered the voyage practicable, but he wished to point out that which would remove the possibility of a doubt, because if the first attempt failed, it would cast a damp upon the enterprise and prevent a repetition of the attempt."*

"What I did affirm in 1836-37," continues Dr. Lardner, "was that the long sea voyages by steam which were contemplated could not at that time be maintained with that regularity and certainty which are indispensable to commercial success by any revenue which could be expected from the traffic alone, and that without a government subsidy of a considerable amount such lines of steamers, although they might be started, could not be permanently maintained."

He then proceeds to show, up to 1851, the commercially non-success of transatlantic steamers that were not subsidized, and adds:

"Thus it appears, in fine, that after a lapse of nearly fourteen years, notwithstanding the great improvements in steam navigation, the project advanced at Bristol, and there pronounced by me to be commercially impracticable, signally failed."—Admiral Preble, United Service.

* Museum of Science and Arts, vol. x., 1856.

* London Times, August 27, 1837.

Antarctica.

The time has come when it is possible to state, with a considerable degree of accuracy, the physical conditions of the Antarctic regions, much in the same way as constructive geography assigned an extensive plateau to the center of Africa, before the genius of Stanley Africanus outlined for the world the Congo basin with its million square miles. The adventurous voyages of Cook, Palmer, Bellinghausen, Weddell, Balleny, D'Urville, and especially of Wilkes and Ross, definitely determined the location of certain isolated points, while the admirably planned and skillfully conducted cruise of the Challenger resulted in such a wealth of physical observations that Carpenter and Murray have been able to read the riddle of Antarctica, as Murray terms the southern continent.

Scarcely an attentive physicist doubts that this land, of quite continental area and inconsiderable average elevation, is covered by an eternal yet ever-changing ice sheet that swallows up all but its highest peaks. Formed from successive snowfalls of centuries, the ice cap moves, in the line of least resistance, seaward, through the interactions of various forces, of which that arising from changes of temperature seems most potent. Its outward march into the ocean, unwasted by the freezing temperature of the sea water, presents a towering perpendicular front of from 1,000 to 2,000 feet thick, which plows the ocean bed until, through flotation in deep water, disruption occurs, and a floeberg is born. The unvarying temperature of the Antarctic sea, from surface to bottom, proves that no stratum of colder water exists poleward, and the thickness of the ice barrier proclaims a continental or extensive land area, on which only such unparalleled ice sheets could have been formed. The most marvelous aspects of these desolate regions are the active volcanoes, which rear their glowing cones, and pour forth their showers of scoriæ, and rivers of molten lava, to the south of both Patagonia and New Zealand, on opposite sides of the Antarctic circle.

Thus Antarctica is a continent of wonderful contrasts and unsurpassed desolation. The severity of its wintery summer offsets the comparative mildness of its sunless winter. While a fauna peculiar to its icy waters obtains over its ocean bed, with vegetable life more abundant than in any other sea, yet its barren land furnishes forth no trace of vegetation—not even a lichen or a seaweed. The sea is so filled with animal life, small crustaceans, that the Challenger's tow nets occasionally burst from repletion, while fish and seal, whale and penguin, abound. On its desolate shore, for a few weeks each year, the nesting sea bird finds perfect solitude—the only absolute solitude on the wide earth—that means safety to its broods. Here notice a manifestation of universal law, that the ceaseless, silent and seemingly feeble forces of nature, which create and maintain the ice cap, are more potent than the terrible, intermittent and seemingly irresistible forces, as seen in the volcanoes. And thus it is that the eternal ice sheet, which grinds forever its continental rocks—granite, diorite and quartz—reflects definitely back, through long months of polar night, the upshooting pillars of fire from numberless volcanoes that dot the land of Antarctica.—Gen. A. W. Greely, in the Cosmopolitan.

HON. CHAUNCEY DEPEW, President of the New York Central Railroad, says that 90 per cent of the defalcations and thefts and ruin of youth among people who are employed in places of trust are due directly to gambling. "I have seen in my vast employment so much misery from the head of the family neglecting its support and squandering his earnings in the lottery or the policy shop, and promising young men led astray in a small way, and finally becoming fugitives or landing in the criminal dock, that I have come to believe that the community which licenses and tolerates public gambling cannot have prosperity in business, religion in its churches, or morality among its people."

THE EIGHTH AVENUE PLAZA AT THE ENTRANCE TO CENTRAL PARK.

Some weeks ago we presented our readers with a characteristic scene on lower Broadway, in this city. It was a reproduction of a photograph taken during a fire, and showed the great thoroughfare with the traffic in part suspended, while the fire engines were stationed on it. We now show another view in New York. The reader must transport himself some four miles to the north and west of the former place, to the plaza at the corner of 8th Avenue and 59th Street. Here the southwestern entrance of Central Park is situated; from the plaza the continuation of 8th Avenue, Central Park West as it is called, extends to the Harlem River, while to its west the Boulevard opens, and extends in an irregular course to the north.

In the foreground of the cut is seen the rostral column erected by the Italian residents of the United States in honor of Columbus. The beautiful granite column, with projecting bows of galleys and anchors to mark it as a naval trophy, has on its base bronze reliefs of the scenes of Columbus' life. Above one of the bronzes is a marble group of a winged youth or genius with a globe, symbolizing the discoverer's faith in his work, while the noble figure cut from Carrara marble, and representing the great discoverer, overlooks from its summit the metropolis of the land which he found.

The view shown is that of one looking uptown to the north and west. On the right appears Central Park, the city's great pleasure ground, a region which is within the memory of many New Yorkers as a dismal wilderness of rocks and shanties; but which now is one of the most beautiful of pleasure grounds, and what is more to the purpose, one which is thoroughly utilized by the citizens. Along the Park runs the continuation of Eighth Avenue or Central Park West, from whose western side many stately buildings look down upon the foliage and lawns of the great pleasure ground. Running a little more to the west, in a slight diagonal from Central Park, is seen the Boulevard, the successor of the old Bloomingdale Road. This impressive street is very wide, providing two parallel roads. Much of its surface is now paved with asphalt, and through its center runs a series of grass plats, with a double row of elms therein. Along the sides are two other rows of elms, the four series of trees shading and marking the course of a picturesque and unique roadway. It runs through one of the most beautiful residential portions of the city, a region comprising the Riverside Drive and the streets contiguous to it. Many of the streets are paved with asphalt, and they are characterized by one of the most varied and picturesque arrays of dwelling houses that have ever been erected in New York. In this region the architect has departed from the old brown stone front of the packing box type, and has produced street after street of really beautiful and picturesque city dwellings. In this district, to the west of the Boulevard, is Riverside Drive, winding along the banks of the Hudson River many feet above its waters. To its east, far uptown, is beautiful Morningside Park, overlooking the plains of Harlem. These are among the most picturesque features of the city. On the high ground to the east of the Boulevard, above 110th Street, and between the Boulevard and Morningside Park, is the site for the new Columbia College and other institutions, and for the new Episcopalian cathedral.

It is the gateway to this characteristic region that is guarded by the beautiful Columbus monument erected on occasion of the quadri-centennial of the discovery of America.

THE EIGHTH AVENUE PLAZA AT THE ENTRANCE TO CENTRAL PARK.

Laboratory and Science Notes.

Drying Mercury.—When mercury has been used in physical experiments or in gas analysis, it often becomes dirty and wet. If it becomes contaminated with zinc or lead, prolonged treatment with dilute nitric acid may be required to purify it. Washing with water has to be resorted to in such cases as these to remove all soluble impurities. Often in experimental work it gets wet with pure water. The drying of mercury in such cases is quite troublesome, unless time can be given to it. Where time is at the experimenter's disposal, the use of porous battery cups is highly to be recommended. The wet mercury is poured into one of these and is shaken about a little and left standing. The porous cup absorbs the water by capillarity, and it evaporates. In a few hours the mercury is perfectly dry. If no porous cup is at hand, the wet mercury may be poured into a tumbler and one or two pieces of thick blotting paper are thrust down between the mercury and the glass, so that several inches project above its surface. These act as described, absorbing by capillarity the water. This evaporates from the paper above the mercury. The meniscus of the metal tends to cause the water to settle down against the sides of the porous cup or against the paper, when it is at once absorbed.

Caps for Acid Bottles.—When strong acids or liquid chemicals are carried about in glass-stoppered reagent bottles, there is constant danger of the stoppers coming out, and of the contents escaping. For such bottles India rubber finger caps, such as are sold in the rubber stores, form admirable covers. These are sprung on over the stoppers and flange of the neck. They not only secure the stoppers from coming out, but even if a stopper loosens or leaks, nothing can escape.

Hypo. Slops for Silver Plating.—Sodium hyposulphite is a well-known basis for a silver-plating bath. The hypo bath of the photographer after it has been used for fixing will act as a plating bath. It is enough to put into it the article to be plated with a bit of zinc resting on it, when a coating of silver will soon make its appearance. Medals and coins can be quite prettily plated in this way. Where wire tongs are used for handling negatives, the ends of the tongs will often become quite thickly plated by their repeated immersions in the liquid in the hypo. tray.

The Convertibility of the Dynamo.—Electric fans, such as are constructed for use on the direct current, may be made to give a very simple illustration of the intra-convertibility of the dynamo and motor. If the fan is placed in a window through which a strong draught of air passes, the fan will act as a windmill and will rapidly rotate. If a galvanometer is connected to the ends of the wires, quite a difference of potential will be observed. On connecting the same wires to a source of current, the apparatus again becomes a motor.

History of the Locomotive Whistle.

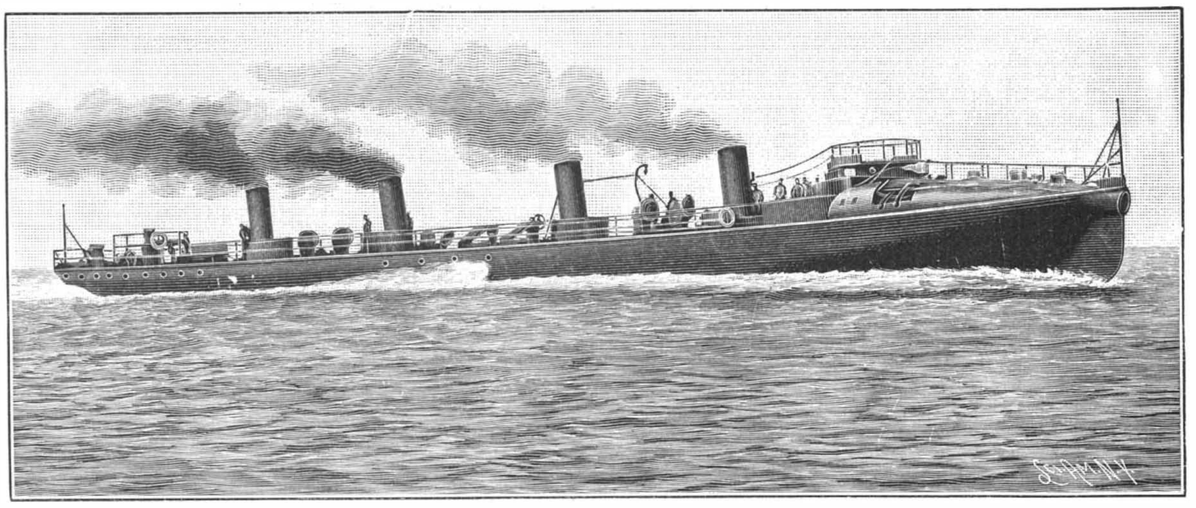
Messrs. R. Stephenson & Co., in August, 1832, commenced the construction of two locomotives for the Leicester and Swannington Railway Company; these had cylinders 14 inches in diameter, 18 inches stroke, and four coupled wheels of 4 feet 6 inches diameter. The wheel base was 4 feet 9 inches and the total length of the frame 17 feet. The first of these engines was named Samson, the second Goliath.

One of the first events in the history of the Samson was that it ran into a horse and cart crossing the line at Thornton, the cart being loaded with butter and eggs for the Leicester market. The engine driver had but the usual "horn," and could not attract attention. Mr. Ashlen Bagster, the manager of the railway, went the same day to Alton Grange to report the circumstance to Mr. George Stephenson, who was one of the directors and the largest shareholder. After various ideas had been considered, Mr. Bagster remarked: "Is it not possible to have a whistle fitted on the engine which steam can blow?" George Stephenson replied: "A very good thought. Go and have one made;" and such an appliance was at once constructed by a local musical instrument maker. It was put on in ten days, and tried in the presence of the board of directors, who ordered other trumpets to be made for the other engines which the company possessed. The accident at Thornton was, therefore, the origin of the steam whistle; and the bell whistle, as we now have it, is simply an improvement upon the steam trumpet.

THE TORPEDO BOAT DESTROYER FERRET.

The third of the large fleet of torpedo boat destroyers built for the British government has just completed her official trials, and the builders, Messrs. Laird, of Birkenhead, have to be congratulated on a highly successful issue.

The Ferret is 194 feet long between perpendiculars, with 19 feet 3 inches beam, the ratio being, therefore, about 1 to 10, and at a draught of 5 feet the displacement is 220 tons. The hull is divided into twelve main compartments by water-tight bulkheads, and a water-tight lower deck is built forward of the machinery space, below which there are eight separate water-tight magazines and storerooms, and a water-tight flat is fitted aft of the machinery space. Abaft the machinery 40 feet is devoted to the wardroom and cabins where the officers are berthed, and the crew is accommodated forward. The bunker capacity is 70 tons. The armament consists of one 12 pounder and three 6 pounder quick-firing guns, one pair of torpedo tubes on the deck, and one tube in the bow. She carries the new 18 inch torpedoes.



THE TORPEDO BOAT DESTROYER FERRET.

The engines are of Messrs. Laird's fast running tri-compound type, the cylinders being 19 inches, 29 inches and 43 inches in diameter by 18 inch stroke, and it is worthy of notice that all parts of the engines are accessible when working at full speed, as Messrs. Laird have been able to arrange a good passage at the back of the machinery, which will no doubt be found of great advantage compared to the ordinary torpedo boat type of engine room. The two circular condensers are placed forward of the main engines instead of in the wings, which involves an increase in length of engine room, but gives a wider platform between the engines and a good passage all round, as indicated.

The average speed of six runs on the measured mile was 27·612 knots per hour. Mean indicated horse power, 4,507.

When considering the design of the boat, it became necessary to adopt the water tube type of boiler on account of the saving of weight which it admits of as compared with the locomotive or any other type, and, after careful consideration, Messrs. Laird decided to adopt the Normand type, which has been proved in the numerous torpedo boats built by Messrs. Normand at Havre to give excellent results. The Ferret's performance has fully justified the selection, no difficulty being experienced throughout the three hours' trial in maintaining the steam at the intended pressure. There was no indication of priming, either on the official or any of the preliminary trials, and, therefore, one of the principal difficulties of the water tube type has been overcome.

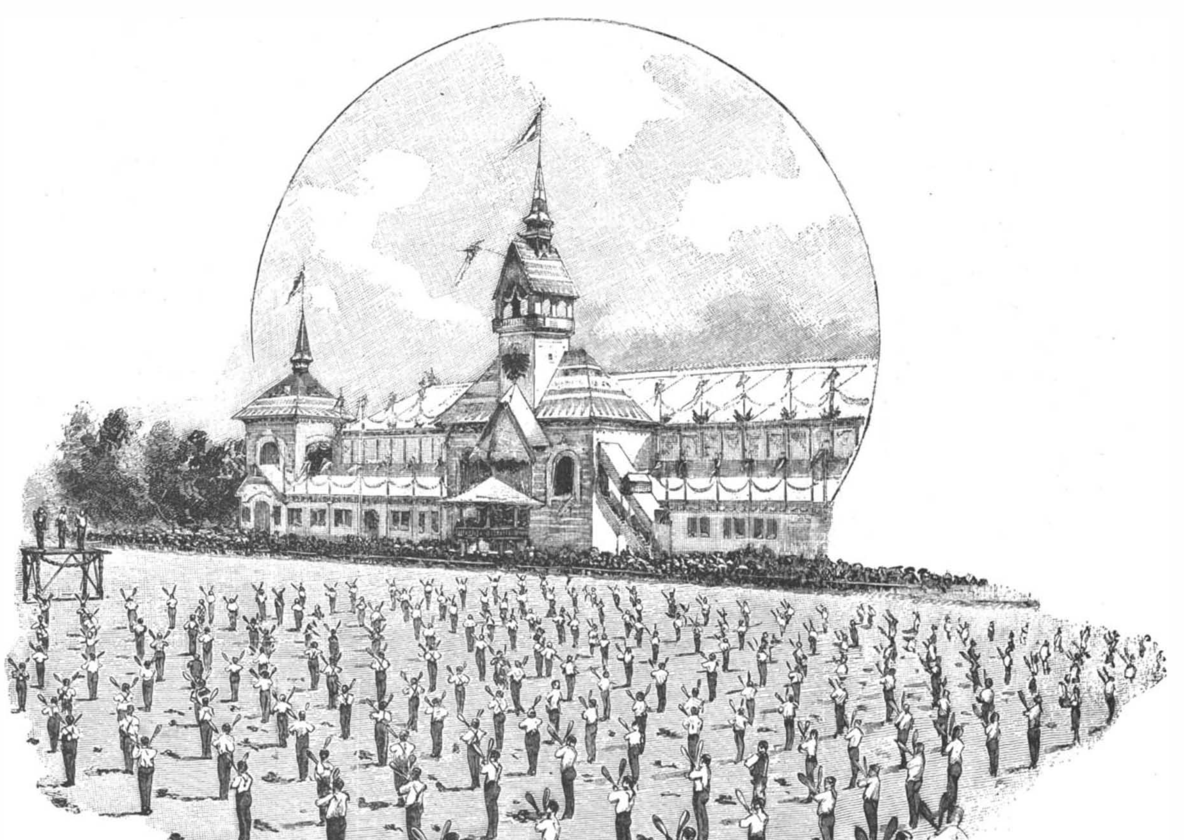
The official trial took place on the measured mile at Skelmorlie, on the Clyde, on the 10th of July, in the presence of Mr. Deadman and Mr. Pledge, representing the Constructor's Department of the Admiralty, and Mr. Ellis, the engineer-in-chief, and Mr. Hobbs, of Devonport Dockyard. The builders were represented by Mr. J. M. Laird and Mr. R. R. Bevis, Jr.

The three hours' trial was commenced at 10:15 A. M., the vessel having on board her full normal weight, the coal in bunkers being 26 tons, and the average speed for the whole time was found to be 27·51 knots with 361 revolutions. After the run the usual trials as to maneuvering were made—the helm was put from hard over to hard over both ways in less than 12 seconds each at full speed, and the steering was proved to be entirely satisfactory. There was a remarkable absence of vibration when running at full speed, and no hitch of any kind occurred in the machinery. The speed for the six runs on the measured mile is the highest ever yet recorded by any vessel for Her Majesty's navy on the Admiralty official trial, and, seeing that the speed of the engines was only 361 revolutions per minute, there seems no likelihood of there being any difficulty in maintaining this at future times when the vessel is in commission.

We are indebted to Engineering for the foregoing particulars, and to the Engineer for our engraving, which is from a photograph of the vessel taken when going at highest speed.

THE FESTIVAL OF ATHLETES IN BRESLAU.

Every four or five years there is a review of the disciples of Jahn, in the form of a universal German "Turnfest," or festival of athletes. The eighth of these festivals was held in Breslau from the 21st to the 25th of July, and was attended by thousands of athletes from all parts of Germany and other European states, and even from far-off America. About 12,000 guests marched from the railroad station through the richly decorated streets of the Silesian capital. In the southern part of the city, at the end of the beautiful Kaiser-Wilhelm Street, is a fine square of twenty-nine acres, that was given up to athletic sports during the festival. On the south side of this square a fine hall was erected which commanded the whole square. It was built entirely of wood, ornamented with towers, and the interior was handsomely decorated. The windows reminded one of painted church windows, but really were only canvas saturated with oil. The first evening there was a fine reception, and the next day a long procession marched through the city. Fifteen thousand men took part in this and about 600 were dressed in fancy costumes, thus varying the monotony which must have prevailed if the procession had been composed entirely of the different clubs in their gymnastic suits. After the procession the athletic sports began with a club swinging performance by 250 men from Saxony. This is shown in the accompanying illustration, for which we are indebted to the Illustrirte Zeitung. There were performances by specially fine gymnasts, and contests of various kinds, including a game of football. On the last afternoon the prizes were distributed, bringing the festival to a happy close.



THE FESTIVAL OF ATHLETES, BRESLAU.

Death from Acid Fumes.

The Druggists' Circular tells of a gentleman of this city who lost his life some weeks since by a rather uncommon accident. In the prosecution of his business he occupied a portion of a building so constructed that to reach a floor occupied by another tenant it was necessary to pass through his premises, and this tenant used large quantities of nitric acid in a manufacturing business in which he was engaged.

While two men were carrying a carboy of this acid through the store of the gentleman mentioned it was broken in front of his private office. As the fumes became manifest all other persons in the vicinity fled, but the gentleman, fearing that fire would result, insisted on remaining and attempting to prevent further damage. This delay proved fatal. He inhaled enough of the deadly vapor to induce such extensive injury of the lungs that he died the next day.

Had the unfortunate man been more familiar with the extreme danger of inhaling the vapor of nitric acid, he would doubtless have escaped with his life, but he evidently failed to understand or realize the fact that its immediate effects are not always its worst ones.

It is doubtful if even many druggists and chemists are fully aware of the risk involved in the inhalation of this or similar corrosive vapors. When any of the liquids from which they may arise happen to be spilled in appreciable quantity, prompt retirement from the scene is necessary to insure escape from severe if not fatal injury.

Preservation of Wood.

The wood is impregnated through its pores, under any well known process, first with a strong solution of calcium bisulphite and then with a corresponding solution of caustic lime. A monosulphite is formed, which is subsequently oxidized by the action of the air to calcium sulphate, and becomes practically part of the ligneous structure. — A. A. Hely, Westminster, Eng.

Sensitizing Canvas, Silk, and Paper.

A mixture of bromide and iodide of silver is precipitated at a temperature of 28° C. in the presence of a trace of gelatine, and is maintained at that temperature for an hour or so with constant agitation, so as to prevent the precipitate from coagulating. It may then be washed in a centrifugal machine to remove the alkaline nitrate, and is finally well mixed with a cold solution of arrowroot which has been boiled in water till perfectly clear. The fabric or paper to be sensitized is then coated by means of a sponge in the dark room and dried, and if the emulsion has not been washed it is soaked in water for an hour and dried again. Development takes place as for an ordinary gelatino-bromide emulsion. Prints so made lend themselves far more readily to finishing in crayons, oils, or water colors than when the fabric has been coated with an emulsion in gelatine, as there is no fear of the whole film stripping off the canvas. Paper prints made with the arrowroot emulsion may also be finished both with chalk and the brush, which was impossible before, "owing to the impenetrable nature of the gelatine film."—G. J. Junk, Berlin.

The Sea—Its Extent and Depth.

It is hopeless to do more than to briefly sketch the amount of our knowledge.

First, as to the greatest depths known. It is very remarkable, and from a geological point of view significant, that the very deepest parts of the ocean are not in or near their centers, but in all cases are very near land.

One hundred and ten miles outside the Kurile Islands, which stretch from the northern point of Japan to the northeast, the deepest sounding has been obtained of 4,655 fathoms, or 27,930 feet. This appears to be in a deep depression, which runs parallel to the Kurile Islands and Japan; but its extent is unknown, and may be very large.

Seventy miles north of Porto Rico, in the West Indies, is the next deepest cast known—4,561 fathoms, or 27,366 feet; not far inferior to the Pacific depth, but here the deep area must be comparatively small, as shallower soundings have been made at distances sixty miles north and east of it.

A similar depression has been sounded during the last few years west of the great range of the Andes, at a distance of fifty miles from the coast of Peru, where the greatest depth is 4,175 fathoms.

Other isolated depths of over 4,000 fathoms have been sounded in the Pacific. One between the Tonga or Friendly Islands of 4,500 fathoms, one of 4,478 fathoms near the Ladrones and another of 4,428 fathoms near Pylstaart Island, all in the Western Pacific. They all require further investigation to determine their extent.

With these few exceptions, the depth of the oceans, so far as yet known, nowhere comes up to 4,000 fathoms, or four sea miles; but there can be little doubt that other similar hollows are yet to be found.

The sea with the greatest mean depth appears to be the vast Pacific, which covers 67 millions of the 188 millions of square miles composing the earth's surface.

Of these 188 millions, 137 millions are sea, so that the Pacific comprises just one-half of the water of the globe, and more than one-third of its whole area.

The Northern Pacific has been estimated by Mr. John Murray to have a mean depth of over 2,500 fathoms, while the Southern Pacific is credited with a little under 2,400 fathoms. These figures are based on a number of soundings which cannot be designated otherwise than very sparse.

To give an idea of what remains to be done, I will mention that in the eastern part of the Central Pacific there is an area of 10,500,000 square miles in which there are only seven soundings, while in a long strip crossing the whole North Pacific, which has an area of 2,800,000 square miles, there is no sounding at all. Nevertheless, while the approximate mean depth I am mentioning may be considerably altered as knowledge increases, we know enough to say that the Pacific is generally deeper than the other oceans. The immensity, both in bulk and area, of this great mass of water is difficult to realize; but it may assist us when we realize that the whole of the land on the globe above water level, if shoveled into the Pacific, would only fill one-seventh of it.

The Indian Ocean, with an area of 25,000,000 square miles, has a mean depth, according to Mr. Murray, of a little over 2,000 fathoms. This also is estimated from a very insufficient number of soundings.

The Atlantic, by far the best sounded ocean, has an area of 31,000,000 square miles, with a mean depth of about 2,200 fathoms.—Capt. W. J. L. Wharton, R. N., British Association.

Compressed Air at Paris.

The Parisian company for the supply of compressed air has recently erected a new central station elevated on the borders of the Seine, by the Quai de la Gare, at the point where the river enters Paris. The new station is situated under much more favorable conditions than the company's other station in the Rue Fargau, and comprises the latest improvements in this class of plant and machinery. Although only 8,000 horse power is at present in employment, the works have actually been designed for horse power up to 24,000, and the compressed air conduit and system has been constructed with regard to this development. The conduit is made of malleable iron pipe of 500 mm. internal diameter, is of about 16,000 meters in length; it couples the old system of 300 mm. diameter and of 16,500 meters length.

The 24,000 horse power plant will be comprised in three similar groups of four engines of 2,000 horse power and four batteries of multitubular boilers with economizers. The actual working installation, as we have mentioned, is of 8,000 horse power. The boilers are of the Babcock & Wilcox type, made by Creusot under license from the Babcock & Wilcox Company. They are twenty in number, divided into four groups of five boilers. The boilers are registered for a pressure of 12 kilos. per square cm., but will normally be worked at 10 kilos. The heating surface of each boiler is 220·64 square meters. The principal dimensions are: Number of tubes per boiler, 108; length of tubes, 5·400 m.; diameter of tubes, 0·100 m.; heating surface of tubes, 2·182 m. Two chimneys, of 50 m. in height and 3·14 m. diameter at the summit, are used for the twenty boilers. Each group of five boilers is served by an economizer of 53 tubes, constructed by Lemoine d'Allines, which sends the warm water through a Schmid water meter.

The results obtained are most satisfactory. Thus, in ordinary working, with crude coal of 15 per cent ash, a production of 9·2 kilos. steam per kilo. of coal burnt with feed water 72 to 80 c. c. is obtained. Feed water is obtained in the following manner: Each machine possesses two feed pumps drawing injection water from the Seine and emptied in a single collector, which receives equally, by the aid of two small pumps, the warm water of condensation from the jackets and drain cocks of the cylinders, as also from those of the conduit of steam pipes. There are two reservoirs which serve to regulate the pressure. Each reservoir serves two groups of boilers. From these reservoirs the water passes by the meters into the boiler, through the economizers; a by-pass permits the feeding of the boilers directly without utilizing the economizers.

The prime motors are triple expansion, vertical, direct-acting, with three cranks and Corliss valve gear.

The compressors are of Professor Riedler's system, compounded with three cylinders. The compressing cylinders are placed on an extension of the steam cylinders. Bronze safety valves with India rubber clacks are arranged in the domes for the entry and exit of air. These safety and bell valves, which open freely under the action of difference of pressure and the air, are closed mechanically. The compression of air is carried on in two stages. Thus, two cylinders out of the three are disposed for low pressure, and draw external air by openings arranged in the roofing of the engine house. This air passes through air tanks, which serve as supply conduits, at a pressure of 2·5 kilos. into an intermediary reservoir where it is quite cooled, and is then drawn by the third cylinder at high pressure, where it is finally compressed to 6 kilos. This last compression can be pushed to 8 kilos. The normal speed of these engines is 60 revolutions per minute, but they are able to run up to 72 revolutions in case of necessity.

The steam distribution is on the Corliss system, with disengaging out-of-gear on the smaller cylinders on the high pressure, without variation in the point of cut-off for the low pressure cylinders. The regulation of the cut-off in the high pressure cylinders is obtained by hand; independently of this regulation a centrifugal regulator prevents all variations of speed above 72 revolutions, in order to prevent any excessive strain falling upon the moving parts. In the case of an abnormal rise in pressure in the stored air, a special regulator comes into play when this pressure exceeds 8 kilos. These two methods of independent regulation act on the same cut-off apparatus.

This machine is furnished with two flywheels on one shaft, disposed on either side of the main framing. The shafts are arranged in line with one another. The whole of the masonry which supports the steam cylinders, the compressors, the crossheads, etc., is held together by cast iron tie rods. Three floors above one another, in checkered iron plate, supported by steel columns and with railing, with steel steps, run the length of the engine room, and give access to the whole of the machinery.

The plant of air pumps, condensers, feed pumps, and ejector pumps is well disposed below the ground level of the engines in a sump pit, 3·700 m. in depth, quite accessible by stairs and well lighted. This pit runs the whole length of the engines, leading to two rooms where the injector pumps are placed. Under these two rooms four sand and sponge filters have been put in, fed by a counter current, and of which any one can be put in or out of service, so as to obtain pure water. These wells are in communication with the Seine by a tunnel which gives the water required for condensation. The main shafts, the connecting rods, the piston rod, and in general all the pieces forming the engines, are of soft steel from Creusot. All the axles, piston rings, etc., are in special soft steel, treated by cementation and annealed. Dimensions and principal data of the engines:

Normal power of each engine	2,000 h. p.
Number of revolutions per minute	60
Pressure of compressed air	8 kilos.
Pressure of steam in boiler	12 kilos.
Diameter of steam cylinders, high pressure	0·9 m.
" " " middle pressure	1·4 m.
" " " low pressure	2·0 m.
" " compressors low pressure	1·1 m.
" " " high pressure	0·78 m.
Common travel of all pistons	1·4 m.
Diameter of flywheels	5·5 m.
" " air pumps	0·8 m.
Travel of air pumps	0·55 m.
Diameter of intermediary reservoir	1·6 m.
Total length of same	6·8 m.

The total weight of the four engines is 1,800,000 kilos. The large steam cylinders weigh each 30,000 kilos. These engines have very marked economy. As a rule, they consume 0·7 kilo. of coal per I. H. P. In trials they have consumed only 586 grms. This figure, which may perhaps appear exaggerated as a minimum, is due not only to the good and perfect workmanship of the engines, but also to the methodical and carefully adjusted boiler plant, economizers, feed, and utilization of waste water.

The cooling of the air is effected by means of injecting water into the compressing cylinders, and into the intermediary reservoir. This water is retained, as also the air, in two large horizontal reservoirs of steel plate placed one above the other, and having 2 m. diameter and 9·5 m. in length. The higher reservoir carries a tubulure for air entrance, a connection for air with the lower one, and a small connection placed at the lower part to act as a drain cock. The lower reservoir carries two tubulures for air exit and a pocket from which flows the injector water, which, as a result of the air pressure, is lifted into a reservoir placed outside the works, and for this the water runs by a conduit communicating with the aspirating part of the feed pumps and the donkey engines. The injector pumps constructed by the firm of Onillacq & Co., of Anzin, have differential bell valves controlled automatically by the system of Professor Riedler. They are worked by two compound machines having each the following dimensions: Diameter of little cylinder, 0·375 m.; large cylinder, 0·55 m.; common travel of two pistons, 0·600 m.; initial pressure of small cylinder, 7 kilos. These machines are provided with variable cut-off by the regulator for the small cylinder and fixed cut-off by simple adjustment of the slide valve for the larger one. No steam jacket is provided for the small cylinder, but a jacket is provided for the larger one to act as a reservoir for the vapor escaping from the small cylinder and to warm it up at the same time.

The regulator enables one to alter the velocity and regulation from 50 to 80 revolutions per minute by the simple adjustment of a counterweight along a scale. Below 50 revolutions the velocity is regulated by acting by hand upon the steam valve. These machines are furnished with a condenser. The differential pumps are of the following dimensions:

Diameter of small plunger	0·212 m.
" " large "	0·300 m.
Travel of plunger	0·600 m.

They can draw easily from 5 m. depth, and give out at 50 m. mean height, and exceptionally to a hundred. The output of each pump is 100 liters per second. The masonry work and buildings, constructed by Joseph Leclaire, of Paris, have dimensions corresponding to the engine and the boiler which they cover. The engine room has 70 m. length, 16 breadth, and 23·1 high to the tie rods of the roof, the machines having a total height of 12·12 m. above the ground. There has been erected an overhead crane of 40,000 kilos., worked by compressed air, which has been used to lift all the machinery and the large reservoirs.

The boiler house is divided into three rooms, the first having a breadth of 11·3 m. and 10·36 m. high; the second, which serves as the coal store, 8 m. broad by 13·5 height; and the third, 16·05 m. breadth and 10·36 high. At the end of these last buildings there has been erected a mechanics' shop, a boiler shop, a grease store, a repair shop, and a room for dynamos driven by motors for the general lighting of the station. All the inclosures interior of these buildings are only one brick thick, 0·055 m. in breadth. The tubing for steam, compressed air, exhaust, feed water, and injectors has been carefully arranged, and would entail too long a description for us to attempt to give here. It has been constructed by the firm of Bonnet Spazin, of Lyons; the machines, compressors, and boilers have been provided by Creusot. The general design and plans have been due to M. Joseph Leclaire, of Paris, and the buildings from the offices of Montreuil sans Bois.—Industries.

How to Cool a Cellar.

A great mistake is sometimes made in ventilating cellars and milk houses. The object of ventilation is to keep the cellars cool and dry; but this object often fails of being accomplished by a common mistake, and instead the cellar is made both warm and damp. A cool place should never be ventilated, unless the air admitted is cooler than the air within, or is at least as cool as that, or a very little warmer. The warmer the air, the more moisture it holds in suspension. Necessarily, the cooler the air, the more this moisture is condensed and precipitated. When a cool cellar is aired on a warm day, the entering air being in motion appears cool, but as it fills the cellar, the cooler air with which it becomes mixed chills it, the moisture is condensed, and dew is deposited on the cold walls and may often be seen running down them in streams. Then the cellar is damp and soon becomes mouldy. To avoid this the windows should only be opened at night, and late—the last thing before retiring. There is no need to fear that the night air is unhealthful—it is as pure as the air of midday, and is really drier. The cool air enters the apartment during the night, and circulates through it. The windows should be closed before sunrise in the morning, and kept closed and shaded through the day. If the air of the cellar is damp, it may be thoroughly dried by placing in it a peck of fresh lime in an open box, and the National Builder adds, a peck of lime will absorb about seven pounds, or more than three quarts, of water, and in this way a cellar or milk house may soon be dried, even in the hottest weather.

"How to Make the Most of Life."

The Grindelwald Conference held this year was marked by a new feature. In addition to the religious discussion which had previously taken place, there was opened on August 13 a literary and scientific department, the debates in which were to continue at intervals for a month. The introductory address in this section was given by a member of our own profession, Sir Benjamin Ward Richardson, with after addresses delivered by Sir Robert Ball, Mr. Whymper, Mr. Carus Wilson, Mr. Edmund Gosse, and several others.

The title of the introductory address was, "How to Make the Most of Life," the lecturer dealing naturally with the physical side of the question in the first place. He set forth by stating that, according to his views, that man or woman who trained himself or herself in the best bodily and mental health made the best of life. He considered the bodily welfare first, not because he reckoned it more important in itself, but because the health of the mind so largely depends on the health of the body. He then described the various conditions leading to good bodily health, and showed how a good engine outlived many of its masters because they attended to it more carefully than they attended to their own bodies; kept it clean, made it regular in its work, freed it from obstruction in its furnaces, and fed it with proper and simple fuel and pure air.

He then traced the relationship of life to maturity, indicating that life should extend five times the period of maturity, so that a man taking twenty-one years to mature should live to 105 years. Such length of life was exceptionally obtained, which showed the possibility of the occurrence; and why it was not more widely obtained in the human species was due to errors, often of the grossest kind, some of which were pointed out. In passing to the question of mental health, the lecturer dwelt on three subjects—diligence, learning, and travel. Diligence he thought a better term than work, because it included everything; diligence in labor, in play, even in sleep. "Blest are the diligent who can command time, Nature's clock." Of learning he said that the most important was historical, and among the historical the most important was biographical. "Know the life of a man of any period," he remarked, "and you must then know not only the man, but his period also." The fact was illustrated from several instances, but especially from such as showed the existence of great men who in their own time were practically unknown; men, for instance, like Stephen Grey, who, in the early part of last century, carried from the Charterhouse to Faversham the elementary parts of our present electrical science in the little basket, from the contents of which he laid down the first elementary electric telegraph.

Dealing with travel, Sir Benjamin Richardson treated on the marvelous expansion of the mind that came from excursions over the world. The famous Dr. William Harvey and men of his school made the "grand tour" in their day. They went to Italy, came back, as it was said, "Italianated," and were thought to be remarkable scholars. Now men went all over the globe; the whole world became their Italy, and they might be said to be "planetated." This was a mode of learning in which the surface of the earth became the living map, the spoken languages, the living grammars—a mode that must extend day by day as the mind yearned for more knowledge and the power that springs from it. He saw no end to a line of learning by travel now inaugurated, and he suggested as the next step that university ships should be manned, not with guns and fighting men, but with professors, laboratories, observatories, and libraries, and in which voyages of research should be made by all classes round the world, England, as mistress of the seas, leading the advance.—The Lancet.

SPEAKING WATCHES.

To get up anything new in the way of watches seems difficult. The precision of the present construction leaves little margin to progress, and the indications that it has been possible to give these small instruments are so numerous and interfere so little with the perfect running of them that we might consider perfection as having been nearly reached in watchmaking.

Mr. Sivan, a French watchmaker, established at Geneva, has, nevertheless, succeeded in stepping outside of the beaten track in devising a chronometer that speaks the hours, instead of striking them, through an ingenious application of the phonograph.

The ordinary repeating watch carries a detent through which it is possible to free a small movement that actuates little hammers which strike spring bells. It is thus possible to strike the hours, quarters and even the minutes at will. This bell device, which is essentially monotonous, requires, moreover, close attention on the part of the owner of the watch, who is obliged to count the strokes and to distinguish the intervals between the hours, quarters and minutes. There are no such inconveniences in the Sivan watch. The spring bells are replaced by a vulcanized rubber disk provided with grooves upon which the hammers bear, through a point. The accompanying figures will permit of the operation being understood.

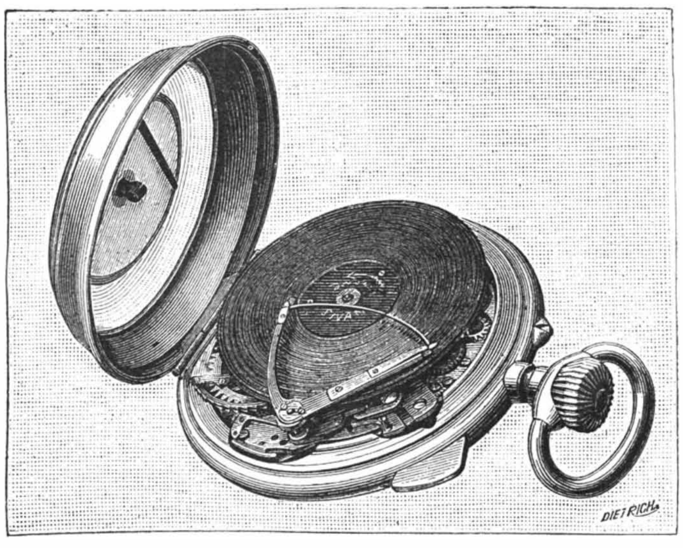


Fig. 1.—SPEAKING WATCH, WITH ITS PHONOGRAPHIC DISK.

Fig. 1 represents the watch open, with its phonographic disk, which is provided with 48 grooves that correspond to the 12 hours and to the 36 quarters traversed by the hand in making one revolution of the dial. Fig. 2 shows the same watch, from which the disk has been removed in order to allow the mechanism to be seen. This disk is seen on the side opposite that carrying the grooves.

When the detent is pressed, the rubber disk begins to revolve, the point that follows its sinuosities vibrates, and the vibrations are manifested by such expressions as "It is eight o'clock," "It is half-past twelve," etc. The grooves, in fact, are the exact reproduction, upon a plane, of the helicoidal groove produced by a human voice upon a phonograph cylinder.

Naturally, watches are not the sole pieces of wheelwork to which this ingenious system is applicable. All clocks may be provided with it, and, for the moment, Mr. Sivan is already constructing alarm clocks which, instead of the strident and ear-piercing bell that every one is acquainted with, have speaking disks. One can thus have himself awakened by the crowing of the cock, or by the vigorous accents of a well known voice. The inventor is constructing some alarms which, with a disk of 6 or 7 centimeters, cry out to you from one room to another, through closed doors, such phrases as "Get up !" "Come, wake up !" loudly enough and long enough to snatch you from the arms of Morpheus.

In addition to the difficulty resulting from the disproportion between the smallness of the grooves and the force that is necessary to give the sound, Mr. Sivan has had several others to surmount. It was necessary, in the first place, to introduce the system into a watch case without exaggerating the latter's dimensions, and afterward to find a plastic, although resistant, material for the disks. These obstacles have been happily surmounted. Mr. Sivan's watches resemble the ordinary repeaters; and their disks, despite the pressure of the point, are capable of speaking several thousand times without showing any appreciable wear.

Further, by retouching the phonographic grooves, suppressing some of them, and exaggerating others, the inventor has succeeded in giving the words pronounced the peculiar accent characteristic of such or such a locality. Amateurs who may not be content with ordinary disks will thus be able to order others that will be true family souvenirs. There is no limit to the variety of the combinations of which the realization becomes possible with this system.

There is one thing, however, that it will be necessary to see to, and that is, that in houses that possess several speaking watches or clocks, the latter shall run in perfect unison. Otherwise their disputes, sources of pernicious examples, might chance to disturb the tranquillity of serious households and cause steady people to lose their reckoning. But the precision of the apparatus easily permits of avoiding such an inconvenience.—La Nature.

CHICAGOANS per capita are not as well policed as Londoners, the police in Chicago numbering only 2,726 for 1,600,000 people against London's 13,814 for 5,000,000 population.

Gas Motor Cars.

The gas motor cars on the Croydon tramways are (says a correspondent of the Glasgow Herald) working satisfactorily, the cost being about 25 cubic feet of gas per car mile. They carry 28 passengers, and go on routes with gradients of 1 in 23, with short lengths of 1 in 16. This cost is against 3⅛d. per mile for fodder and bedding of horses, so that in future this type of motor must be ranked in competition with electric and cable haulage. Indeed, from official returns of the German tramways just out, the results of the gas motor cars are shown to be very formidable. The cost of a car weighing 7½ tons empty, to carry 29 persons, and fitted with two 7 horse power gas engines, is £900, and the gas consumption, with 10 to 12 persons on board, is from 34·7 to 37 cubic feet per car mile. The engines are under the seats, and are arranged to work at three rates of speed, the maximum being 240 revolutions. As to cost of construction, five miles with cars running every five minutes, requiring 20 cars, and working 14 hours per day, is put at £1.040 per mile, including everything; while in Germany the cost for an electric tramway is £7,648 per mile, and for a horse tramway £5.636. The working expenses with gas at 3s. 5d. per 1,000 cubic feet are about 3d. per car mile, with 1 horse cars of 4½ tons weight, carrying 22 persons; and with a 10 horse power gas motor the cost is 4·25d. to 5·4d. per car mile. For electric tramways the cost in Germany has been found to be 3·86d. per car mile. The conclusion arrived at is that, with similar traffic conditions, a gas tram might be expected to give a return of 6½ per cent on the capital invested, while an electric tram would barely cover cost of working.

Acids of Beeswax.

T. Marie describes a method for the extraction of the free acids in beeswax, which gives good results if it is applied to mixtures of acids, so long as bodies belonging to other organic series are absent. Beeswax, when treated by boiling alcohol, yields to this solvent not only the free acids present, but also hydrocarbons, oleic compounds, coloring matters, and myricin, which are difficult to separate properly. The method adopted for obtaining the acids free from these other substances is as follows: After the wax has been treated by the boiling alcohol, the greater part of the latter is subsequently distilled. The cooled and crystalline residue is then squeezed to separate oleic compounds and coloring matters, after which the solid cake is melted, washed repeatedly with boiling water, and further decolorized by charcoal and filtration through paper.

The slightly yellow mass thus obtained melts at 70°. This, after being heated with potash and lime, is cooled, powdered, and mixed with a large quantity of water, which is then heated to ebullition. Dilute hydrochloric acid is then added to neutralize the alkali, and the free acids of the wax combine with the soluble calcium salts in the mixture to form insoluble compounds. The latter are separated, washed, and dried, then treated with boiling alcohol and benzin to remove neutral substances, and decomposed. The acids thus isolated, after crystallization from alcohol, which removes a small quantity of palmitic acid formed from the myricin, melt at 79°–80°. By further treatment with methylic alcohol cerotic acid is dissolved out, and on crystallizing is found to melt at 76°, the melting point being raised to 77·5° after a single crystallization from ethylic alcohol. The residue melts at 78°, and contains melissic acid, described as identical with that extracted from carnauba wax by Story-Maskelyne and Pieverling. Crude cerotic acid is said to contain from 30 to 40 per cent of analogous acids, and Marie announces his intention of further studying the pure compound and its derivatives.—Comp. Rend., cxix., 428.

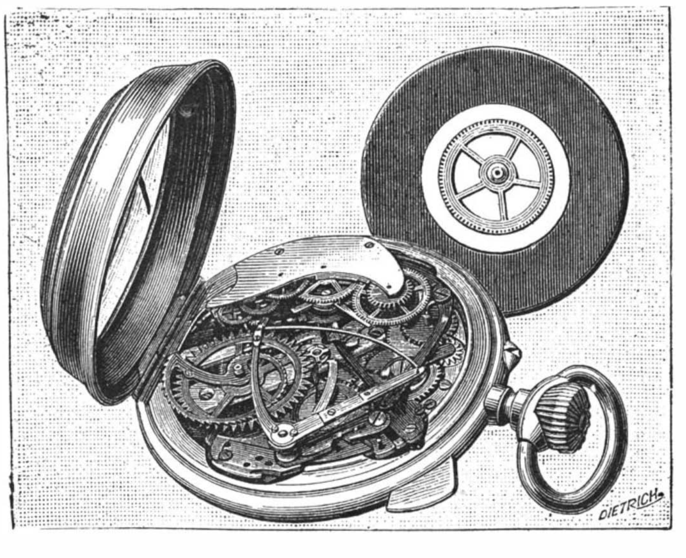


Fig. 2.—SPEAKING WATCH, WITH THE DISK REMOVED, IN ORDER TO SHOW THE INTERNAL MECHANISM.

Thin Films of Gold.

One of the interesting exhibits made at the recent conversazione of the Royal Society, held June 13, 1894, was that of Mr. J. W. Swan, F.R.S., who presented a number of specimens of leaves of gold of extreme thinness, which had been prepared by the process of electro-deposition. From a brief notice of the exhibit, published in London Nature, it appears that it represented an attempt by Mr. Swan to produce gold leaf by electro-chemical, instead of mechanical means. "The leaves were prepared by depositing a thin film of gold on a highly polished and extremely thin electro-copper deposit. The copper was then dissolved by perchloride of iron, leaving the gold in a very attenuated condition. The leaves were approximately four-millionths of an inch thick, and some of them mounted on glass showed the transparency of gold very perfectly when a lighted lamp was looked at through them."

It will doubtless prove somewhat of a surprise to Mr. Swan to learn that identically the same method of procedure for the production of films of metal of extreme tenuity was described and illustrated by Mr. A. E. Outerbridge, Jr., in a lecture delivered before the Franklin Institute in 1877, an abstract of which was published in the Journal.* At the stated meeting of the Institute held May 16, 1877, the then resident secretary, the late Mr. J. B. Knight, made reference in his monthly report to the thin gold films produced by Mr. Outerbridge in the following terms: †

Transparent Gold.—In the course of a lecture on gold, delivered before the Franklin Institute, on February 27 last, Mr. A. E. Outerbridge, Jr., of the Assay Department of the Mint in this city, gave an account of some experiments he had made, with the view of ascertaining how thin a film of gold was necessary to produce a fine gold color.

The plan adopted was as follows: From a sheet of copper rolled down to a thickness of 5-1000 of an inch, he cut a strip 2½×4 inches. This strip, containing 20 square inches of surface, after being carefully cleaned and burnished, was weighed on a delicate assay balance. Sufficient gold to produce a fine gold color was then deposited on it by means of the battery; the strip was then dried without rubbing, and reweighed, and found to have gained one-tenth of a grain, thus showing that one grain of gold can, by this method, be made to cover 200 square inches, as compared to 75 square inches by beating.

By calculation, based on the weight of a cubic inch of pure gold, the thickness of the deposited film was ascertained to be 1-980400 of an inch, as against 1-367650 for the beaten film.

An examination under the microscope showed the film to be continuous and not deposited in spots, the whole surface presenting the appearance of pure gold.

Not being satisfied, however, with this proof, and desiring to examine the film by transmitted light, Mr. Outerbridge has since tried several methods for separating the film from the copper, and the following one has proved entirely successful.

The gold plating was removed from one side of the copper strip, and by immersing small pieces in weak nitric acid for several days, the copper was entirely dissolved, leaving the films of gold intact, floating on the surface of the liquid. These were collected on strips of glass, to which they adhered on drying, and the image of one of them is here projected on the screen, by means of the gas microscope.

You will observe that it is entirely continuous, of the characteristic bright green color, and very transparent, as is shown by placing this slide of diatoms behind the film. By changing the position of the instrument, and throwing the image of the film on the screen by means of reflected light, as is here done, you will see its true gold color.

Mr. Outerbridge has continued his experiments, and, by the same processes, has succeeded in producing continuous films, which he determined to be only the 1-2798000 of an inch in thickness, or 10,584 times thinner than an ordinary sheet of printing paper, or 60 times less than a single undulation of green light. The weight of gold covering 20 square inches is, in this case, 35-1000 of a grain; one grain being sufficient to cover nearly 4 square feet of copper.

As you see, the film is perfectly transparent and continuous, even in thickness, and presents all the characteristics of the one shown before. That a portion of the image appears darker is due to superposed films, the intensity of the green color being proportioned to the thickness through which the light passes. . . .

It may be stated, in conclusion, that the mode of procedure above described was patented by its author ‡ under the title "Manufacture of Metallic Leaf." In his patent the inventor describes, as "a new and improved method of manufacturing gold leaf, silver leaf and other metallic leaf," the above named method of electrical deposition. As suitable mediums to support his films he mentions copper in thin sheets, and paper, shellac, wax, etc., made conductive upon the surface which is to receive the deposit.

For removing the deposited film from copper and paper, Mr. Outerbridge describes the use of a bath of dilute nitric acid, or of perchloride of iron. In the case of the shellac, wax, etc., alcohol, benzine, and other solvents are referred to.

While they detract neither from the interest nor genuineness of Mr. Swan's work, these circumstances are recalled in justice to Mr. Outerbridge, to whom priority undoubtedly is due.—W., Jour. Fr. Inst.

* Vide Jour. Frank. Inst., ciii, 284.

† Vide Jour. Frank. Inst., ciii, 369.

‡ U.S. Patent, 198,209, Dec. 18, 1877.

A First-Class School for Watchmakers and Jewelers.

The Parsons Horological Institute at Peoria, Ill., of which Mrs. Lydia Bradley has been the beneficent patron, appears to be realizing the solid success which its design and scope made so eminently desirable. It will be remembered that a full description of the institute, with illustrations, was published in the SCIENTIFIC AMERICAN of July 8, 1893. It was the outgrowth of a school for watchmakers originally founded by Mr. J. R. Parsons at La Porte, Ind. The school had got beyond its original limited facilities, when Mrs. Lydia Bradley, of Peoria, Ill., furnished the means for providing a fine building, with all the tools and appliances necessary, for the use of any number of deserving young men and women who wished to learn the trade of watchmaker and jeweler.

The building, and such machinery and appliances as could be turned to the uses of an educational establishment, was for many years used by the Peoria Watch Company, so that a portion of the instruction given is effected by the aid of the tools and appliances formerly employed in making watches for the trade. The location and the conveniences for enabling students to obtain a practical knowledge of the business are all that could be desired, and Mr. Parsons, who had previously devoted many years to the purpose of building up such a school, now finds himself at the head of an ideal establishment of this kind, one of the leading technological establishments of the world in this particular department.

The object of the institute is not to make money, but to turn out competent watchmakers and jewelers, and the tuition is, therefore, made very low. Metal engraving is an important feature of the school, together with the various methods of making and repairing the many kinds of silverware. A lecture on demagnetizing and electricity was recently delivered at the institute by Mr. Fred. Purdy, and a course of lectures by eminent scientists will be delivered the coming winter.

Diamond Mining in South Africa.

Kimberley, in Griqualand, is the center of the diamond traffic of South Africa. Mr. A. G. Phillips, of Johannisberg, South Africa, recently called upon us and showed us some gravel and clay taken directly from the mines of Zelsers, at Delpots Hope, not far from Kimberley. The clay contains specimens of quartz, chalcedony, onyx, and other varieties of stones and conglomerates, and the small diamond crystals are found embedded in the deposits, which are apparently alluvial deposits carried down in past ages by the feeders of the Orange River. In the separating of the clays from the pebbles the latter wash out very smooth and round and show evidences of having been carried long distances before being deposited in their present localities. The diamonds themselves further verify this hypothesis, as in some cases they are found as perfect crystals, but more often as fragments. They are not alone found, however, in alluvial deposits, as in many cases the matrix in which they are embedded is volcanic matter that has been forced up in channels or pipes from inferior deposits.

The method of separation is very simple and primitive, and it would seem that great economy could be effected by the introduction of mechanical washers, but the negro labor is so cheap that up to the present time there has been little advance over the original methods first introduced. It would seem that the dishonesty of the negroes would, however, force the mine owners to introduce any methods that would lessen their opportunities for stealing. The clay as it is taken from the mines is simply washed in a series of gauze trays, which permit the water and mud to flow away, but retain all substances of any considerable size. These screens are made of different capacity or grades, and the pebbles are therefore separated according to their sizes and collected in trays, where they are carefully examined. The negroes are very acute and are wonderfully alert in discovering the presence of the much-sought-for gems. One negro under the present system only washes on an average about sixteen cubic feet of earth a day. All the cunning of their nature is called out in their endeavors to elude their masters and to smuggle gems out of the mines without being detected. Every workman as he leaves the mines is subjected to the most rigid examination. All his clothes are removed and the inspectors make a most thorough examination of his person. Their ears, mouth, nose, toes, and toe and finger nails are all carefully investigated, and severe punishment is meted out to any one found attempting to steal.

They are never permitted to pass out of the sight of the mine police, and in case they have procured permission to leave the precinct of the mines and to visit the neighboring towns, they are kept in confinement, and their whole system is subjected to a thorough cleansing with purgatives for a period of ten days before they are released. In spite of every precaution that can be taken, the stealing cannot be stopped, and it is claimed that nearly 25 per cent of the South African diamonds sold in the market are illicit or stolen property. This is so in spite of a police system more perfect than is to be found anywhere outside of Russia. A complete record is kept of every stone mined, and the red tape that has to be gone through in the purchase of a diamond is very striking. An intending purchaser in any of the well known markets has to make application of the authorities to purchase certain stones. Written permission is then granted him and the transfer is made, then the purchaser has to procure a license to carry about with him and take out of the country the diamonds in question. The license states the number and weight of the stones, their color and general appearance, where they were mined, whom they were bought from, the purchase price, and every detail of the transaction that would tend to identify them. It is expedient for any one carrying a gem on his person to have his license with him, as he is liable to be stopped at any time by a detective or policeman, and if he is suspected of being an illicit dealer, his person is searched and he is required to establish the identity of any stones found on his person. His license, of course, will accomplish this, but in case he cannot produce it, or cannot refer to the public registration, which is always made when the license is issued, he is thrown into prison and tried as an I. D. B., as the illegal diamond buyers are called. There are a large number of I. D. B.'s, both whites and blacks, now working out long sentences at the government penitentiary. The sentences are very severe, as the colonial government is doing all in its power to wipe out the illegal traffic. Many of the diamond thieves escape into the neighboring provinces, where they cannot be reached by the laws in the colonies. The Orange Free State, which is very near the diamond district of Griqualand, is a favorite refuge for smugglers, and fugitives from justice find this the same haven of rest that Canada is to fugitives from this country.

It is no wonder that the blacks try to steal, although, as a rule, their compensation is very meager. It is said that the king of one of the leading tribes has a half bushel basket full of diamonds that he has exacted from the natives of his tribe upon their return to their native land.

He rents out the services of his subjects, and one condition of his permission to leave the country is that upon their return they must present their chief with a diamond or its equivalent in gold.

The I. D. B.'s, however, are not all so desirous of fleeing the colony, and many of them carry on their trade in a manner so cunning and so secret that they feel secure from justice, and in some cases, although their nefarious traffic may be an open secret, they have amassed fortunes which they are permitted to enjoy, owing to the fact that there is no legal proof that can be brought against them. One notable instance of this is the case of a Jew, who came to Griqualand some twelve or fifteen years ago, and who, in some mysterious way, has amassed a fortune of nearly a million pounds, upon which he is now living in great magnificence. He is known to be an I. D. B., but he has covered up his transactions with such cleverness that the accusations against him are only whispered. He has been elected a member of Parliament, and no doubt now intends to become a respectable member of society.

A Balloon Struck by Lightning.

An occurrence partaking of the nature of the Franklin experiment is reported from Aldershot. A captive balloon was held by a wire cable about 200 feet long. Suddenly it was struck by lightning, which ignited the gas, the balloon falling to earth amid a loud peal of thunder. Three of the sappers at the winch below were seen rolling on the ground, apparently in intense pain. This is attributed to their connection to the wire cable through the brass handles of the winch. One, a bugler, had the inside of his hand rather badly burnt, but the worst case of all showed no external signs of injury. The car of the balloon fell without doing any damage. On examination it was found that all the upper part had been burnt away, though the metal valve was almost uninjured. Had any one been in the car, even if he had escaped uninjured from the electric shock, he would have had a terrible fall. None of the sufferers were very seriously injured.

THE United States has over four hundred institutions known as college or university.

RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER SETTING.—Charles V. Kerr, Fayetteville, Ark. The setting and furnace of the boiler are so constructed, according to this invention, that the flames are carried twice the length of the boiler before entering the boiler tubes, the flames impinging upon the bottom and sides of the boiler in such a way, through a novel arrangement of flues in the masonry, as to produce an even heat, and utilize all the heat before the smoke enters the stack, thereby giving great efficiency with economy of fuel.

PUMP.—Vett S. Reed and Daniel Apgar, Loveland, Col. This is a rotary pump in which the casing has a fixed transverse partition from which leads a platform, inclines leading downward to the bottom of the casing, while a rotatable piston head carries a series of pistons arranged to slide through it, and a plate spring fixed to the top of the stationary casing is arranged over the partition in the circular path of the several pistons, the free end of the spring bearing upon them as they pass successively beneath it and drop off the platform. The invention constitutes a lift and force pump designed to be very efficient and to utilize the power to the greatest advantage.

Railway Appliances.

DRAWBAR GUIDE.—Heinrich W. F. Jaeger, Sandusky, Ohio. This is a device adapted to be readily applied on the draw timber of freight cars. It has on its inner face a recess for receiving the followers, end flanges to be bolted to the inner face of the drawbar timber, an offset extending out from the guide between the flanges to engage a recess in the inner face of the drawbar timber, and a rib projecting from the offset to engage a further recess in the drawbar timber. An essentially horizontal flange extends outward from the guide at the bottom, and beyond the outer face of the rib, the flange being adapted to be bolted to the bottom surface of the drawbar timber.

HAND CAR.—Joseph McMurrin, Shoshone, Idaho. According to this invention, the propelling mechanism for the car is arranged at its ends, instead of near the center of the car, to leave a clear space in the center in which ballast, rails, etc., may be piled. A simple, strong and easily operated driving mechanism is provided, pinions on the axles being turned by gear wheels, actuated through a crank from a driving rod, the latter being driven by a hand lever.

Electrical.

ARC LAMP.—Harold E. Bradley, New Bedford, Mass. In this lamp are a feed rod and tilting lever, and main and shunt magnets to tilt the lever and operate the feed rod, with a spring plate cut out and a relatively stationary plate in its path of travel. The improvement is designed to simplify and cheapen arc lamps and improve the feed, while the resistance and cut-out automatically short circuit the lamp if the current becomes too strong. The lamp is durable, easily placed in position and designed to give a steady light.

Agricultural.

PLOW.—Richard E. Hopkins, McGaheysville, Va. The point may be slid into the share of this plow so as to project a considerable distance beyond, or be withdrawn within it, rendering the point as long or as short as desired, or it may be so located that when thrust outward it will have a downward as well as an outward movement, being extended or withdrawn while the plow is running. There is also a vertical cutter at the forward portion of the share, and a horizontal shear cutter at the lower forward side of the wing or mold board, the shears or cutters being readily removed for sharpening and quickly and easily replaced.

POTATO PLANTER.—Millard F. Myers, Greenville, Ohio. This machine is designed to feed either large or small seed, depositing it in the hill. A horizontally rotating planting disk has a series of adjustable pockets, there being a driving connection between the axle and the disk, over which is a hopper containing the seed. Two operatives are necessary to work the machine and place the seed, but the machine is of very simple and inexpensive construction and designed to be very effective.

FERTILIZER DISTRIBUTER.—Lewis Roat, Milton, Pa. This machine consists of a hopper-like body supported on wheels in such way that it may be used as a cart when not employed as a fertilizer distributer, and there is combined therewith a removable pulverizer and spreader composed of a toothed cylinder, a detachable shaft having a spline connection with the cylinder, a drive shaft connected with the detachable shaft, and means which operatively connect the axle and drive shaft.

HAND SEED SOWER.—William R. Bowen, Clayton, Fla. This is an inexpensive device for sowing ordinary garden seeds or for sowing broadcast small seeds, fertilizers, insecticides, etc. It consists of a cup with a handle and rounded bottom, near the center of which is a good-sized opening, while to the bottom are journaled two disks—a dropping disk and a broadcast disk. The former has a series of openings to permit the discharge of seed when the disk is adjusted in register with the larger opening in the cup bottom, while the broadcast disk has other adjustable openings for the discharge of seed, insecticides, etc.

HOP CLEANING MACHINE.—Raphael M. and John P. Mackison, North Yakima, Wash. This machine has an elongated frame supporting an inclined bed with a carrying apron to carry away the dirt, dust, leaves, etc., deposited by the hops, which are delivered to a carrier or apron from a chute in the upper end of the frame. Means are provided for adjusting the bed, which is adapted to clean the apron on its under side, and the construction is such that perfectly clean hops may be delivered rapidly from one end of the machine.

Miscellaneous.

SPRINKLER HEAD FOR AUTOMATIC FIRE EXTINGUISHERS.—John H. Dixon, Marietta, Ohio. This is a device for systems which become operative when the heat rises above a certain temperature. It has fusible parts arranged in such a way that they do not directly or indirectly affect the sealing of the head, which is normally closed by an automatic valve so supported that the water pressure forces it open when the fusible stops are softened. The valve also forms a deflector to throw the water evenly around all sides of the sprinkler head.

BOOT TREE.—William J. Yapp, 210 Sloane Street, London, S. W., England. This device has a toe and heel portion, jointed to which is an intermediate adjustable thrust rod adapted to act as a toggle to apply pressure to the front or toe portion. The action of the device applies the pressure in an upward thrust against the front of the upper near the instep. This boot tree is very light, easily applied and adjusted, and may be packed away in small space.

BOX LIFTER.—Henry Eddishaw, Philadelphia, Pa. For handling boxes placed overhead out of ordinary reach, this inventor has devised a light and easily operated device which may be used instead of a ladder, for facilitating the taking down of the box. It comprises a supporting pole, on which is a head with upwardly extending arms, a shelf being supported beneath the head, and one of the parts being revoluble with respect to the other. There is a lever mechanism at the lower end of the pole for operating the shelf, which slides on the pole, and a pivoted lever for engaging the end of the rod projecting from the shelf, so that the box may be handled with safety by the device, without fear of dropping it.

WALL PLASTER COMPOSITION.—James E. Summers, Clifton Forge, Va This is a composition which freezing does not injure and moisture does not penetrate. It is made of pulverized lime, cement, plaster of Paris, pulverized furnace slag, and other ingredients in specified proportions, made of the desired consistency with water. As a plaster it can be easily finished with one coat, becoming as hard as stone.

DENTAL PLUGGER.—Augusto A. Nouel, Jr., Puerto Cabello, Venezuela. This invention consists of a head or socket fitted to slide and having a socket to receive the point or tool, a spring-actuated hammer engaging the head and a hand lever lifting the hammer and then releasing it to permit it to suddenly exert its force on the head. The construction is simple and the device works automatically.

COPY BOOK CABINET.—Robert E. Ashbrook and Milton H. Ingram, Paducah, Ky. In this case or cabinet the books will be kept from warping and getting out of shape, the leaves being kept smooth and prevented from drawing up. It has a movable shelf guided by or carried to or from a stationary shelf by exterior mechanism, and the case may thus be made to take the place of a letter press for ordinary letter copying. The framework consists of skeleton sides, between which the shelves are arranged in pairs, one shelf of each pair being stationary and the other adjustable to or from it.

VEHICLE DOUBLETREE. — Samuel J. McDonald, Gallatin, Mo. According to this invention, where the doubletree is pivoted on the draught pole, the ends of a curved bar are secured to the doubletree, the bar having on its under side spaced ears projecting down on opposite sides of the pole, while a forked brace plate is secured to the doubletree and to the curved bar. The attachment is designed to obviate the tendency of the doubletree to rock on its coupling bolt under strain, and prevent the elongation of the bolt hole.

FIFTH WHEEL.—Samuel K. Paden, Petersburg, Ohio. Combined with an axle and wooden bolster having recesses or sockets in opposite sides is a base plate having pendent, parallel, integral flanges which closely embrace the sides of axle and bolster, pendent tubular bosses fitting in the bolster sockets. The invention is an improvement in that class of fifth wheels in which the king bolt or analogous connection is dispensed with, and plates or disks rigidly attached to the axle and bolster are employed, the disks rotating on each other and being held together by side clips.

SASH FASTENER.—Ferdinand F. Unkrich, Galion, Ohio. The working parts of this device are adapted to sound an alarm if tampered with. It is a sash lock of simple and inexpensive character, adapted to retain the sash at any desired point of sliding adjustment, affording means of securely locking the sash either entirely open, partly open, or completely closed.

CULINARY VESSEL.—David C. Wood, Matamoras, Pa. This is a double-walled vessel, with a bottom and side space for water and steam, the cooking being effected in the interior compartment. The cover has a connection with the side steam space, and is provided with a steam exit, and the cover also has a steam chamber which covers the entire inner compartment, the heat from the steam compartment of the cover contributing to the cooking at the top of the articles in the inner vessel, and the cooking being effected without danger of burning.

ROASTER.—Neils H. Jensen, Philadelphia, Pa. This construction is more especially designed for roasting coffee beans, cocoa, etc., without requiring a large amount of fuel. It comprises a lower furnace and an upper spherical roaster having trunnions journaled in the furnace door to swing with it, the roaster having a covered opening for inserting and removing its contents, and an outlet at right angles for shells and impurities, there being a flaring or dished shield on the interior of the roaster around the outlet opening.

HEATING DRUM. —Henry I. Grennell, Ashland, Wis. This is a drum to be ordinarily inserted in the pipe to form a passage for the smoke and gases, and a controllable passage for air, to be heated thereby and contribute to the heat of a room, the drum being readily connected with stoves, furnaces, etc. The passage of the smoke and gases through the shell of the drum is retarded, that they may give up all their heat to the regulated air currents for which channels are provided through the drum.

BOX TOP.—Lyman Miller, Lexington, Ky. This is an improvement readily applicable to show cases, packing boxes, etc., and is cheap enough to be applied to almost any box or case. It is a top or side of such construction that the boxes or cases in which it is used may be piled safely one upon the other, and yet have the goods in them readily displayed. The improvement comprises a pair of swinging doors, a tight joint being formed between them, and the doors being closed automatically by a spring attachment. When one of the doors is swung open, a stop holds it in open position for such time as desired against the tension of the spring.

LOGGING APPARATUS.—Anderson W. Brown, Rhinelander, Wis. For drawing logs over icy roads this invention provides a sleigh-carrying engine and boiler, there being on the sleigh transverse shafts having sprocket wheel and chain crank connection with the engine, the shafts operating eccentrics with legs whose feet have cutting toes. The latter engage the ice in the road to push the apparatus forward, the eccentrics being so set that some of the legs will always be pushing, and the apparatus being designed to draw heavy loads, and move forward evenly.

MECHANICAL DOLL.—Daniel S. McElroy, New York City. Movable legs, arms and head are so connected, according to this invention, that by moving one of the arms the leg on that side will be moved in the same direction, the same movement also causing the turning of the head. The leg and arm of either side are connected by a train of gearing, and on the pivot of one of the arms and on the neck are engaging bevel wheels, the moving of one of the arms causing the legs to move in imitation of walking, the head at the same time turning from one side to the other.

DESIGN FOR A WASHBOARD PLATE.—James A. W. Sears, Menominee, Mich. In the upper side of this plate are parallel transverse ribs and intervening flat surfaces, the flat under side of the plate having rounded grooves opposite the ribs of the upper side.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6241) A. N. J. writes: 1. An empty tin can 9½ inches long and 4½ inches square, with an opening ¾ inch in diameter at the top, well corked so as to be air tight, was sunk in about 70 feet of water. The cork was withdrawn while at that depth, and upon pulling the can to the surface the can was badly crushed in. Can you tell me when the collapse took place, and what was the cause thereof? A. The can probably commenced to collapse at a few feet below the surface, as its square form had but very little resistance to the increasing pressure as it sank, which at 70 feet would be 30 pounds on each square inch of its sides. The air on the inside had no resistance until it was compressed by the collapsing sides. 2. Will brass stop cocks injure, for photographic purposes, hyposulphite of soda and alum solutions? A. Brass stop cocks are not suitable for hyposulphites. The sulphur attacks the brass.

(6242) W. G. J. asks: Can rubber be mixed with asphalt so as to make it flexible? A. By masticating pure raw rubber in benzole, and thinning asphalt with the same or with naphtha, the two can be mixed by grinding or rubbing, and the benzole, etc., can then be distilled off. The mixture may be quite flexible. The use of turpentine instead of benzole will make it more flexible and sticky.

(6243) F. F. M. says: Can you give me a formula for glycerine of cucumber?

A. White castile soap	½ oz.	
Pommade de concombre	1	"
Rose water	30	fl. oz.
Glycerine	2	fl. oz.

Cut up the soap small and dissolve it in about 4 ounces of water. Melt the pomade and put it in a hot mortar. Gradually add the hot soap solution, stirring until thoroughly mixed, then slowly add the rest of the rose water mixed with the glycerine. Keep well stirred until cool, then let stand for some hours, stirring occasionally. Properly manipulated, a perfect emulsion is obtained. When completed it may be perfumed as desired. The soap employed should be of good quality.

(6244) F. A. writes: Referring to query 6203, in your issue of September 1, 1894, of SCIENTIFIC AMERICAN: 1. What is the E.M.F. of the sulphate of mercury battery described in query as above? A. About 1¼ volts. 2. How does the resistance and capacity for work compare with same size of bichromate of potash cell? A. It is not used for heavy work. 3. Does the battery run down on open circuit? A. It maintains itself very well.

(6245) A. N. M. asks: 1. What size storage battery would be required to run a 4 horse power electric motor 6 hours? A. Allowing 7 square feet of positive plate per cell, 40 cells would be required. 2. And how many 6×8 gravity cells would be required to charge storage nattery? A. A prohibitive number. The minimum would be 100, and 10,000 would be none too many.

(6246) S. E. G. says: What causes the disease on fruit trees called "black knot," also the treatment for it? A. Answer by the Department of Agricul-

ture.—Black knot is caused by a fungus known as Plowrightia morbosa. Spores or seeds enter the tissue through cracks in the bark, multiply and grow, forming the "knots." Experiments in Massachusetts indicate that painting the knots with linseed oil or kerosene will prevent further growth. Best and surest way is to cut off branches or knots from large branches and paint wound with some sort of varnish or put on grafting wax to keep out the air.

(6247) J. U. asks: In making the induction coil described in "Experimental Science," what size spark would I get by using No. 30 wire instead of No. 36? A. The spark would probably, for the same weight of wire, be not over one one-hundredth the original length.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 18, 1894,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Account keeping device. E. McCulley.......... 526,194
Acid, making nitric, M. Prentice.......... 526,116
Adjustable bracket, A. W. Browne.......... 526,020
Air brake coupling, W. Borbridge *et al.*.......... 526,178
Air brakes, automatic lock for, W. Mable.......... 526,189
Air or gas compresser, H. A. Barber.......... 526,288
Aluminous cake and making same, J. V. Skoglund.......... 526,205
Antirust ware, Wells & Allis.......... 526,357
Axles, antifriction device for, Crooker & Weinhold.......... 526,298
Bag. See Hand bag.
Bag making machine, W. H. Kerr.......... 526,107
Baling press, J. A. Spencer.......... 526,060
Ball. See Foot ball.
Band cutter and feeder, V. C. Bailey.......... 526,287
Band cutter and feeder, C. H. Hill.......... 526,351
Barrel, W. H. Cadwell.......... 526,069
Battery. See Electric secondary battery.
Bearing, roller, B. D. Tabor.......... 526,120
Bed, sofa, Gillen & Godfrey.......... 526,150
Bicycle, V. Belanger.......... 526,360
Bit. See Bridle bit.
Bit stock, F. M. Hay.......... 526,314
Block. See Pavement block.
Blotting pad, A. Fornander.......... 526,366
Blower, T. Kitson.......... 526,236
Blowing engine or compressor, W. E. Good.......... 526,031
Boiler. See Steam boiler.
Boiler furnace, E. Boileau.......... 526,363
Boiler furnace, smokeless, P. J. Bode.......... 526,289
Boiler furnace, steam, O. D. Orvis.......... 526,048
Bolt, J. W. Sammis.......... 526,266
Books, blotter attachment for check, Toland & Conkey.......... 526,121
Boot or shoe polishing machine, E. O. Bicknell, 526,361, 526,362
Boring machine, Pringle & Brodie.......... 526,198
Bottle closing device, A. W. Schroedter.......... 526,329
Bottle rack, J. E. Goerger.......... 526,309
Bottle stopper, G. L. Matthews.......... 526,247
Bottle washer, T. Wendling.......... 526,277
Bottling apparatus, A. A. Pindstofte.......... 526,086
Bracket. See Adjustable bracket.
Brake. See Velocipede brake. Wagon brake.
Brake mechanism, automatic fluid pressure, H. Guels.......... 526,187
Bridle bit, M. Lesser.......... 526,241
Bucket, A. Mitchell.......... 526,084
Buffing machine, S. W. Winslow.......... 526,137
Buggy boot, W. J. Kauffman.......... 526,233
Buggy cushion, F. Lon.......... 526,041
Burning garbage, etc., apparatus for, J. C. Anderson.......... 526,284
Burning garbage etc., method of and apparatus for, J. C. Anderson.......... 526,283
Cable grip for logging and other purposes, G. Gagnon.......... 526,224
Calcium bisulphite liquor, making, M. L. Griffin.. 526,076
Calculator, F. G. Nelson.......... 526,196
Can. See Oil or gasoline can.
Car and air brake coupling, combined, S. W. Summers.......... 526,119
Car coupling, W. F. Drew.......... 526,303
Car coupling, N. S. Duggan.......... 526,102
Car coupling, F. H. Hitchcock.......... 526,128
Car coupling, J. O. Miller.......... 526,250
Car coupling, J. J. Schairer.......... 526,202
Car, express, Morel & Ferrer.......... 526,191
Car, freight, J. Rhoads.......... 526,261
Car gate, A. M. Black.......... 526,214
Car, railway passenger, J. Krehbiel.......... 526,156
Cash register and indicator, J. P. Cleal.......... 526,296
Cereals, preparing, W. Onderdonk.......... 526,256
Chain, conveyer, J. Dick.......... 526,072
Chain, drive, J. H. Mitchell.......... 526,161
Chain, galvanic, F. Fritsche.......... 526,182
Chair. See Dental chair. Revolving chair.
Charcoal, treatment of animal, J. A. Dubbs.......... 526,180
Check attachment, R. Sears.......... 526,204
Check, conductor's, A. Ross.......... 526,264
Cheese curds in a continuous manner, producing, E. G. N. Salenius.......... 526,165
Chromium, electro deposition of, Placet & Bonnet.......... 526,114
Cigarette machine, continuous, A. L. Munson.... 526,192
Cistern cleaner, J. W. Hawk.......... 526,077
Clamp. See Fence clamp.
Clippers for wool or hair, construction of mechanical, Ashberry & Barnes.......... 526,359
Clothes drier, L. W. Pond.......... 526,115
Clutch, friction, R. T. Wingo.......... 526,171
Coal or coke fork, J. Kreitz.......... 526,109
Coal or rock drilling machine, E. Carnduff.......... 526,294
Coffee pot, J. Tobin.......... 526,331
Coffin hand lift, W. H. Pope.......... 526,134
Collars, machine for forming turndown or rolled, R. N. Martz.......... 526,246
Condenser, surface, F. M. Wheeler.......... 526,208
Converter, multiphase, H. O. C. E. Wagemann.... 526,063
Cooler. See Milk cooler.
Core for casting hollow cylinders, F. Gandy.......... 526,029
Cores for casting, apparatus for manufacture of, W. H. Drake.......... 526,101
Cotton openers, etc., dust or cleaning trunk for, J. C. Potter.......... 526,326
Cotton picking fingers, driving mechanism for, A. Levedahl.......... 526,158
Coupling. See Air brake coupling. Car coupling. Car and air brake coupling. Hose coupling. Pipe coupling. Water closet coupling.
Crib, folding, J. S. Mackie.......... 526,081
Crupper fastener, C. E. Barker.......... 526,098
Cultivator, pulverizing, H. Strasser.......... 526,207
Cup head or piston packing, J. F. Pruden.......... 526,053
Curtain attachment, window, J. M. Freeman.......... 526,306
Cushion. See Buggy cushion.
Cut-off mechanism, W. W. Wallace.......... 526,274
Cutter. See Band cutter.
Cylinders, securing teeth to, J. H. Dunbar.......... 526,304
Dental chair, E. B. Cushing.......... 526,071
Dental plates, forming, G. W. Traphagen.......... 526,332
Depth gauge, A. G. Hollister.......... 526,105
Dial transmitter, Pearce & Broich.......... 526,356
Disinfecting device, W. Moackler.......... 526,252
Disintegrating fibrous plants, machine for, A. L. Evia.......... 526,103
Display holder, A. L. Stone.......... 526,135
Dock, dry, Moeser & Erpel.......... 526,190
Door check, F. A. Phelps.......... 526,164
Door lock, sliding, W. H. Kaldrider.......... 526,232
Dough raiser and fruit drier, S. Q. Duncan.......... 526,028
Draught equalizer, H. Sturm.......... 526,271
Dress shield, E. M. Welcker.......... 526,276
Drier. See Clothes drier.
Drying kiln, W. G. Galloway.......... 526,349, 526,350
Drying machine, P. C. Hewitt.......... 526,228
Drill head, A. J. Cooper.......... 526,297
Drill rod grab, W. H. Wisherd.......... 526,358
Dust arrester, A. Volm.......... 526,334
Electric cut-out, E. E. Hersh.......... 526,227
Electric generator, H. O. C. E. Wagemann.......... 526,064
Electric indicator, C. J. Coleman.......... 526,220
Electric machine, dynamo, D. H. Wilson.......... 526,170
Electric motor, A. W. Meston.......... 526,083
Electric motor, E. Thomson.......... 526,169
Electric switch, L. Winterhalder.......... 526,172
Electrical connector, J. B. Henck, Jr.......... 526,078
Electrically operated register for barrels, etc., H. J. Bang.......... 526,140
Elevator shaft gate, Lamb & McClure.......... 526,237
Engine. See Blowing engine. Explosive engine.
Engine shaft rotation indicator, J. W. Ray.......... 526,259
Envelope, safety, C. F. Molly.......... 526,112
Envelopes, adjustable perforator and cutter for business, P. H. Flynn.......... 526,347
Excavating and amalgamating machine, combined, A. W. Robinson.......... 526,056
Excavator, J. P. Griffin.......... 526,226
Explosive engine, H. F. Fraser.......... 526,348
Extractor. See Ingot extractor.
Fat, reducing animal, J. Lister.......... 526,322
Feed regulator, J. A. McAnulty.......... 526,254
Feedwater for steam boilers, purifying, C. Stickle 526,330
Feedwater heater, F. W. Lycett.......... 526,188
Fence clamp, wire, Boots & Eakright.......... 526,123
Fence fastener, J. Harris.......... 526,311
Fence, wire, E. D. Barling.......... 526,368
Fiber drying apparatus, W. Saulmann.......... 526,201
Filter, S. G. Derham.......... 526,027
Fire extinguisher, C. J. L. MacLeod.......... 526,159
Fire extinguisher and alarm, automatic, J. E. Musselmann.......... 526,355
Flagstaff, T. J. Murray.......... 526,253
Flask. See Moulder's flask.
Football, W. R. Thomlinson.......... 526,136
Footwear, F. T. Kee.......... 526,234
Fork. See Coal or coke fork.
Fuel support or grate, E. Fales.......... 526,073
Furnace. See Boiler furnace. Heating furnace. Hot air furnace. Smokeless furnace.
Fuse for shells, time, Dreger & Wratzke.......... 526,344
Gauge. See Depth gauge.
Gas, apparatus for the manufacture of hydrogen, H. M. Lovejoy.......... 526,243
Gas apparatus, water oil, H. Fourness.......... 526,364
Gas meter, prepayment, W. N. Milsted.......... 526,251
Gas under pressure, vessel for containing, W. W. Pope.......... 526,257
Gasometer, coin-controlled, Alexander & Thompson.......... 526,138
Gate, J. L. Harris.......... 526,312
Gate. See Car gate. Elevator shaft gate. Safety gate. Water gate.
Gearing for heavy machinery, driving, O. C. Wolf 526,281
Generator. See Electric generator.
Glove wrapper, T. A. Baril.......... 526,340
Gold or silver from ores, apparatus for and process of extracting, P. Danckwardt.......... 526,099
Governors, speed recorder of motive power engine, E. Lachmann.......... 526,321
Grain separator, W. Reid.......... 526,200
Grate, combined dumping and shaking, E. Fales.. 526,074
Grinding mill, W. N. Hartshorn.......... 526,313
Grinding mill, S. Schwarzenberger.......... 526,203
Grinding or facing machine, L. L. Lamb.......... 526,238
Guns, cartridge stop for magazine, G. T. Thornhill.......... 526,272
Hand bag, lady's, A. Hinkel.......... 526,037
Handle. See Umbrella handle.
Handle bar, adjustable, A. O. Very.......... 526,333
Harvester, G. G. Hunt.......... 526,352
Harvester, corn, W. S. Osborn.......... 526,197
Harvester, cotton, E. Whiting.......... 526,209
Harvester elevator, A. Stark.......... 526,166
Hat blocking and band cutting machine, C. M. Snell.......... 526,269
Hay and stock rack, combined, E. N. Avery.......... 526,173
Hay carrier track, J. W. Provan.......... 526,052
Hay rack, hay stand, and stock wagon, combined, W. P. Kimbrell.......... 526,039
Hay stacker and loader, combined, W. H. Rouse.. 526,367
Heater. See Feedwater heater.
Heating furnace, water, A. Anderson.......... 526,096
Hinge, flush lounge, J. W. Brown.......... 526,019
Hinge, furniture, J. H. Stiggleman.......... 526,270
Hinge, spring, A. A. Page.......... 526,162
Hoisting apparatus, L. Rosenfeld.......... 526,263
Horseshoe, M. E. Poupard.......... 526,050
Horseshoe, jointed, J. B. Hague.......... 526,034
Horseshoe, sectional, M. E. Poupard.......... 526,049
Horseshoe, segmental, M. E. Poupard.......... 526,051
Hose coupling, A. L. Bailey.......... 526,174
Hot air furnace, W. Ryan.......... 526,087
Hot air heater, W. Heckert.......... 526,316
Indicator. See Electric indicator. Engine shaft rotation indicator. Station indicator.
Ingot extracting apparatus, Aiken & Wood.......... 526,094
Ingot extractor, H. Aiken.......... 526,093, 526,095
Inkstand, C. B. Smith.......... 526,059
Inlaid work for decorative purposes, H. A. Cousins.......... 526,343
Jack. See Lifting jack.
Joist support, continuous metal, W. H. Drake.... 526,302
Journal bearing, D. J. Davis.......... 526,026
Journal bearing, adjustable, L. Hollingsworth.... 526,131
Journal box, H. B. Williams.......... 526,336
Jugs, etc., mount for, Fryer & Coles.......... 526,104
Kiln. See Drying kiln.
Knife. See Pocket knife.
Knife clamping or securing device, H. S. Buckland.......... 526,292
Knives, making, G. M. Griswold.......... 526,033
Knitted doll, S. E. Holmes.......... 526,319
Lacing hooks, machine for setting, I. E. Chandler.......... 526,295
Ladder tower, extensible, H. Hoffmann.......... 526,318
Lamp, incandescent electric, D. J. Cartwright.... 526,145
Lantern, J. C. Shull.......... 526,058
Last, shoe, A. T. & J. Harper.......... 526,035
Lasting pinchers, F. Eckert.......... 526,345
Lifting jack, S. S. Joy.......... 526,153
Limbs, coaptating pad for artificial, J. F. Rowley. 526,057
Lock. See Door lock. Nut and bolt lock.
Lock case, Magovern & Scanlan.......... 526,323
Loom Jacquard mechanism, B. H. Gledhill.......... 526,365
Loom pattern mechanism, Hill & Smith.......... 526,036
Lubricator, W. W. Dashiell.......... 526,025
Machine base, adjustable, J. J. Wood.......... 526,066
Measurer and cutter, wall paper border, E. Hoke. 526,038
Measuring and marking machine, fabric, A. H. Sutton.......... 526,061
Measuring or packaging fabrics, speed regulating attachment for machines for, R. W. Watson.. 526,275
Mechanical movement, W. W. Beaumont.......... 526,213
Meter. See Gas meter.
Milk cooler, L. N. Lean.......... 526,239
Milking machine, cow, W. B. Bland.......... 526,215
Mill. See Grinding mill. Rolling mill.
Moulder's flask, F. Morris.......... 526,113
Motor. See Electric motor. Wave motor.
Motor governor, J. Dow.......... 526,301
Mowing machine, G. Beekman.......... 526,018
Nail machines, wire feeding device for, C. W. Richards.......... 526,117
Neckwear pin, H. B. Rich.......... 526,055
Newspapers, reviews, or other printed matter, classifier for, H. Wetzel.......... 526,279
Non-conducting coverings, fastening for, P. Carey.......... 526,022
Nut and bolt lock, J. E. Garvin.......... 526,308
Oil distributer for ships, gravity, J. Ericson.......... 526,126
Oil or gasoline can, T. W. Alexander.......... 526,338
Ore concentrator, L. Look.......... 526,242
Package, M. J. Meeker.......... 526,249
Pad. See Blotting pad.
Paper sheets, case for, J. J. Yeates.......... 526,282
Pavement block, L. Weinman.......... 526,090
Pen rack, stand, and case, combined, W. J. Hunter.......... 526,079
Pencil sharpener, C. F. Wickland.......... 526,280
Pin. See Neckwear pin.
Pipe coupling, J. D. Anderson.......... 526,097
Pipe wrench, chain, J. H. Newell.......... 526,047
Placards, etc., machine for bordering, M. Funke.. 526,307
Plane iron, W. F. Kellett.......... 526,154
Plating one material with another, T. A. Edison.. 526,147
Plow, J. L. Aldred.......... 526,122
Plow, T. J. Kelley.......... 526,235
Pneumatic tool, J. G. Carlinet.......... 526,342
Pneumatic tube fisher, W. C. Bloomer.......... 526,141
Pocket knife, D. A. Stiles.......... 526,167
Pole, vehicle, E. Clark.......... 526,219
Press. See Balingpress. Printing press. Stereotyping press.
Pressed steel seat, Wadsworth & Avery.......... 526,273
Pressure regulator, fluid, Hopkins & Dickson.......... 526,320
Printing press, D. Maurer.......... 526,248
Protractor, C. H. Chunn.......... 526,023
Pump, S. M. Chase.......... 526,070
Pump, air, R. C. Barbour.......... 526,175
Pump, centrifugal, H. A. Barber.......... 526,339
Pump, oscillating, A. Geiger.......... 526,127
Pump, steam vacuum, Zschech & Sumbling.......... 526,067
Pump valve, steam, J. Farley.......... 526,149
Rack. See Bottle rack. Hay and stock rack. Pen rack.
Railway bond, electric, D. D. Book.......... 526,142
Railway cattle guard, P. L. Brady.......... 526,124
Railway rail joint, Zollinger & Pattee.......... 526,212
Railway switch, automatic, C. Dietz.......... 526,100
Railway switch, street, J. C. Jacobs *et al*.......... 526,152
Railway systems, substructural support for, J. D. Reed.......... 526,054
Railway time signal, A. C. Gordon.......... 526,032
Railway tracks, etc., vegetation burner for, Dawson & Thomas.......... 526,300
Refrigerator, G. A. Greene.......... 526,225
Register. See Cash register.
Regulator. See Feed regulator. Pressure regulator.
Rendering tank, A. White.......... 526,091
Revolving chair, J. M. Morgan.......... 526,045
Rifles, method of and dies for the manufacture of band forgings for military, Bailey & Bowen 526,286
Rolling mill, McMurtry & Stitt.......... 526,195
Rolling mill, tube, C. G. Larson.......... 526,157
Ropeway clip, elevated, W. R. Wiggins.......... 526,092
Saddle, riding, J. M. Martin.......... 526,133
Safe bolt work, E. W. Fowler.......... 526,181
Safety gate, F. W. Young.......... 526,211
Salicyl anilid, S. Radlauer.......... 526,258
Sand band, W. M. Farr.......... 526,075
Sash fastener, C. Rolffes.......... 526,262
Sash fastener, J. Seadler.......... 526,268
Sash fastener, J. O. Sharp.......... 526,118
Sash fastener, D. B. Wesson.......... 526,278
Sausages into links, machine for forming, H. Lefeber.......... 526,080
Saw and resaw, combined band rip, E. C. Mershon.......... 526,160
Saw attachment, R. McLane.......... 526,255
Scholar's companion, F. D. Martin.......... 526,110
Scrubbing machine, floor, W. W. Head.......... 526,315
Seal, E. J. Brooks.......... 526,218
Seal, snap, E. J. Brooks.......... 526,217
Seat. See Pressed steel seat.
Secondary electric battery, Theryc & Oblasser (r) 11,442
Separator. See Grain separator.
Sewing machine, S. H. Wheeler.......... 526,335
Sewing machine, shoe, G. R. Peare.......... 526,325
Shaft support, vehicle, C. H. Knight.......... 526,108
Sharpener, razor, P. J. Caesar.......... 526,125
Shingle strips, machine for manufacturing supplementary metallic, C. H. Dana.......... 526,299
Show top, S. S. Goldman.......... 526,186
Signal. See Railway time signal.
Signal apparatus, J. P. Coleman.......... 526,179
Signal apparatus, Thomas & Seward.......... 526,168
Smoke consuming apparatus, Morris & Goodwin.. 526,085
Smokeless furnace, C. Murray.......... 526,193
Snow shoe, folding, H. Bremer.......... 526,216
Soap, inserting floats in cakes of, W. Berry.......... 526,068
Sounds, apparatus for collecting, concentrating, and distributing, S. D. McKelvey.......... 526,046
Speed of pulleys, etc., mechanism for regulating, J. Redding.......... 526,199
Stand. See Washstand.
Station indicator, E. Miller, Jr.......... 526,111
Statistics, machine for compiling or tabulating, H. Hollerith.......... 526,129
Statistics, machine for tabulating, H. Hollerith.. 526,130
Steam boiler, Connelly & Schafer.......... 526,024
Steam boiler, J. J. Tonkin.......... 526,062
Stereotyping press, W. J. Egan.......... 526,148
Stoker, mechanical, T. R. Butman.......... 526,341
Stopper. See Bottle stopper.
Stove, caboose or other, J. Spear.......... 526,206
Stovepipe attachment, L. Reaser.......... 526,260
Street sweeper, F. W. Dessau.......... 526,222
Stringed instrument, J. Connery.......... 526,221
Swing, C. E. Hobbs.......... 526,151
Switch. See Electric switch. Railway switch.
Switch apparatus, J. G. Schreuder.......... 526,328
Syringe, vaginal, Lamb & Hardesty.......... 526,353
Table, J. W. Carver.......... 526,144
Tank. See Rendering tank.
Tanning composition, J. B. Hodges.......... 526,229
Tap or faucet, M. P. Schetzel.......... 526,327
Telephone transmitter, H. L. Baldwin.......... 526,139
Tile, illuminating, C. W. Mark.......... 526,244
Tile, illuminating, J. W. Mark.......... 526,245
Tire, pneumatic, J. N. Goldbacher.......... 526,185
Tool clamping device, H. S. Buckland.......... 526,293
Tool securing device, H. S. Buckland.......... 526,290, 526,291
Top, W. A. Dunlap.......... 526,305
Transit, pocket, D. W. Brunton.......... 526,021
Trolley wire finder, E. Gale.......... 526,183
Type distributing machine, L. K. Johnson.......... 526,106
Umbrella, W. D. Kimball.......... 526,155
Umbrella handle, J. Gilbert.......... 526,184
Valve, J. A. Blair.......... 526,176, 526,177
Valve for steam engines, rotary, F. Lester.......... 526,040
Valve gear, Sargent & Rice.......... 526,267
Valve mechanism for hydraulic elevators, W. F. Cole.......... 526,146
Vehicle seat corner iron, C. C. Field.......... 526,223
Velocipede brake, Hendrick & Fay.......... 526,317
Velocipede, ice, S. Young.......... 526,210
Velocipede saddles, means for supporting, C. de Rossetti.......... 526,265
Veneer cutting machines, quarter-log holder for, M. D. Williamson.......... 526,337
Vessels, apparatus for raising sunken, E. B. Petrie.......... 526,163
Wagon beds or wire stretcher, machine for moving, Irvine & Anderson.......... 526,231
Wagon brake, automatic, D. W. Lee.......... 526,132
Wagon, mail, J. H. Martin.......... 526,042
Wagons, self-closing roller top for transport, H. Muhlberg.......... 526,324
Washstand and watercloset, combined, A. A. Leyare.......... 526,240
Washer. See Bottle washer.
Washing machine, D. R. Borneman.......... 526,143
Watch case pendant, A. N. Gauthier.......... 526,030
Water closet, J. F. Wolff.......... 526,065
Water closet coupling, J. H. Savill.......... 526,088, 526,089
Water closets, connection for broken, A. W. Ayling.......... 526,285
Water gate, automatic, G. Guttenbrunner.......... 526,310
Wave motor, C. A. Merritt.......... 526,082
Wells, construction of oil, O. Fay.......... 526,346
Wires from metal disks or plates, machine for forming, F. H. Howe.......... 526,230
Wood cutting machine, W. Merrill, 526,043, 526,044 526,354
Wrench. See Pipe wrench.

DESIGNS.

Bonbon, E. J. Kaltenbach.......... 23,646
Campaign souvenir, N. Grevstad.......... 23,644
Centrifugal machine casing, H. B. Weiper.......... 23,648
Game apparatus base, F. M. Whiteman.......... 23,647
Garment fastener, D. H. Warner.......... 23,645
Spoon handle, etc., G. W. Shiebler.......... 23,643

TRADE MARKS.

Axles and axle boxes for vehicles, J. T. Richards.. 25,257
Baking powder, S. Guckenheimer & Sons.......... 25,251
Beds, spring, Foster Brothers Manufacturing Company.......... 25,256
Buttons and studs, cuff, collar, and other ornamental, Faelzer Brothers & Company.......... 25,240
Canned goods, spices, flour, meal, sugar, tea, coffee, pepper, and salt, Shaw Brothers.......... 25,253
Canned vegetables, and fruits and bottled catsups and pickles, Huntoon & Gorham.......... 25,254
Castings, tinners' hardware, roofers' supplies, and heater and range fittings, malleable and gray iron, Berger Brothers.......... 25,259
Cornmeal, Indian Rice Milling Company.......... 25,252
Dolls, Hinrichs & Company.......... 25,239
Food prepared from sterilized milk and other ingredients, fermented milk, Y. T. Matzoon Company.......... 25,255
Liniment for internal and external use, O. M. T. Samuels & Company.......... 25,249
Lotion for beautifying the skin, L. V. Young.......... 25,248
Medicine, named, Sharp & Dohme.......... 25,250
Paper, safety, American Bank Note Company, 25,237, 25,238
Preparation, skin, N. H. Outland.......... 25,247
Silk and velvet fabric and ribbons, J. Forest & Company.......... 25,243
Snuff, B. F. Weyman.......... 25,244 to 25,246
Stone and cement pavements, etc., tools and implements for making artificial, Dearinger & Niemier.......... 25,258
Twine, cotton sail, American Net and Twine Company.......... 25,242
Type and advertising cuts, printers', H. F. Herkner.......... 25,236
Yarns and threads, linen and hemp, Finlayson, Bousfield & Company.......... 25,241

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

ARTESIAN WELLS—BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 943. Price 10 cents. To be had at this office and from all newsdealers.

The Scientific American PUBLICATIONS FOR 1894.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

The Scientific American (weekly), one year	$3.00
The Scientific American Supplement (weekly), one year,	5.00
The Scientific American, Spanish Edition (monthly), one year,	3.00
The Scientific American Architects and Builders Edition (monthly), one year,	2.50

COMBINED RATES.

The Scientific American and Supplement	$7.00
The Scientific American and Architects and Builders Edition,	5.00
The Scientific American, Supplement, and Architects and Builders Edition,	9.00

Proportionate Rates for Six Months.

This includes postage, which we pay. Remit by postal or express money order, or draft to order of

MUNN & CO., 361 Broadway, New York.

PROPOSALS.

U. S. ENGINEER OFFICE, ARMY BUILDING, NEW York, September 13, 1894.—Sealed proposals for dredging 360,000 cubic yards, more or less, of material from Harlem River and Spuyten Duyvil Creek, on line of Harlem River Improvement, and for furnishing materials and workmanship for construction of about 500 linear feet of pile revetment for protection of south side of cut through Dyckman Meadow, will be received here until 12 o'clock, noon, October 18, 1894, and then publicly opened. All information furnished on application. ROBERT McGREGOR, 2d Lieutenant, Engineers.

U. S. ENGINEER OFFICE, ARMY BUILDING, NEW York, September 10, 1894.—Sealed proposals for dredging the channels in Newtown Creek, New York, will be received at this office until 12 M., October 11, 1894, and then publicly opened. All information furnished on application to this office. ROBERT McGREGOR, 2d Lieutenant, Corps of Engineers.

U. S. ENGINEER OFFICE, BURLINGTON, VT., September 5, 1894.—Sealed proposals, in triplicate, for dredging in Ogdensburg Harbor, N. Y., will be received here until 2 P.M., October 5, 1894, and then publicly opened. Full information furnished on application to, SMITH S. LEACH, Captain Engineers.

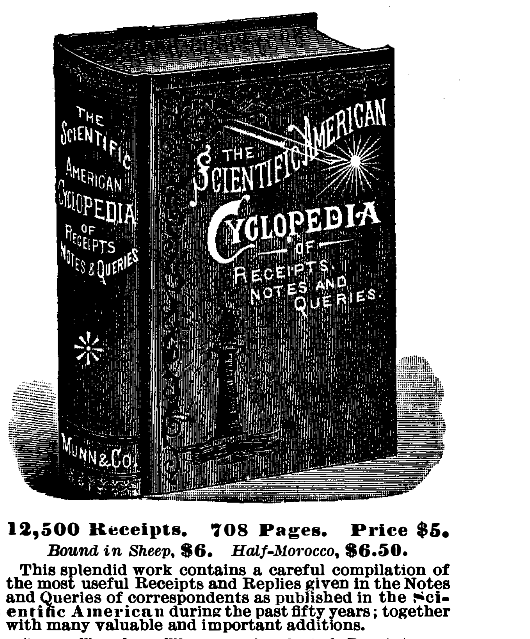
U. S. ENGINEER OFFICE, BURLINGTON, VT., SEPtember 5, 1894.—Sealed proposals in triplicate, for repairs to Burlington Breakwater, Vt., will be received here until 2 P.M., October 5, 1894, and then publicly opened. Full information furnished on application to SMITH S. LEACH, Captain Engineers.

U. S. ENGINEER OFFICE BURLINGTON, VT., SEPtember 5, 1894.—Sealed proposals in triplicate, for dredging to Great Chazy River, N. Y., will be received here until 2 P.M., October 5, 1894, and then publicly opened. Full information furnished on application to SMITH S. LEACH, Captain Engineers.

U. S. ENGINEER OFFICE, BURLINGTON, VT., SEPtember 5, 1894.—Sealed proposals in triplicate for rock excavation in Otter Creek, Vt., will be received here until 2 P.M., October 5, 1894, and then publicly opened. Full information furnished on application to SMITH S. LEACH, Captain Engineers.

VEGETABLE PARCHMENT.—A VALuable paper on the properties, uses and manufacture of this product. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 945. Price 10 cents. To be had at this office and from all newsdealers.

A Valuable Book



12,500 Receipts. 708 Pages. Price $5.

Bound in Sheep, **$6.** *Half-Morocco,* **$6.50.**

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

Send for Descriptive Circular.

MUNN & CO., Publishers, SCIENTIFIC AMERICAN OFFICE, 361 Broadway, New York.

Advertisements.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

- - THE - -

SCIENTIFIC AMERICAN

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage.

Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **Three Dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Postmasters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

- - THE - -

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors,* and with other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

PRINTING INKS.

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York